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SPECIAL WORLD POWER CONFERENCE NUMBER.


# The ELECTRICAL REVIEW

FOUNDED 1872

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M.E.M. *See page xl.*

*Advertisement Index, see page xl.* *Official Notices, see Sup. 46.*

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The

# Electrical Review

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# The World Power Conference.

ON Monday last the first World Power Conference was opened at the British Empire Exhibition, to consider how the natural resources of the world may be best utilised for the production of power for the benefit of mankind. The theme is a noble one, and the setting is worthy of it; for the Exhibition is an epitome of the British Empire, that great commonwealth of nations which is a world in itself.

"Power" is a word with many meanings. Ten years ago the Germans, lusting after "world power," which to their mind connoted domination of the world by armed force, let loose the dogs of war and deluged the earth with blood and fire. To-day the nations take counsel together, not to enslave one another but to promote the cause of peace and freedom—to lighten the burden of human labour by calling to their aid the power that Nature has provided in one form or another throughout the world: power symbolised not by the blood and fire of war, but by the fire and water of peaceful industry.

The greatest prosperity is found in those countries where mechanical power is most fully utilised in manufacturing processes, and where consequently the status of the worker is raised by enabling him to work with his brain rather than with muscle in the performance of his task. A higher standard of living is attained, with greater comfort, corresponding to the higher level of intellectual activity, and thus the cause of civilisation is advanced by the development and use of power.

Some five and twenty years ago it was thought that there was little prospect of any notable improvement in the design or construction of power plant; theory had been pushed as far as the available data permitted, and practice followed its doctrines somewhat restively, often giving preference to the teachings of experience. As in chemistry, the atomic theory was regarded as the last word, so in engineering it was felt that the field of knowledge had been well tilled. But the discovery of radio-activity opened a new world to the chemist and physicist, and similarly the power engineer has learnt that finality is as far as ever from attainment. Who, at the beginning of this century, would have thought seriously of using a steam pressure of 3,200 lb. per square inch, or an exhaust pressure of ½ lb. per square

inch? Or of the transmission of electricity at 220,000 volts? Or of the use of oil engines for the propulsion of large vessels?

Progress is continuous and unending. Even to-day, we are told, the original design of a huge power station may be and often is subject to radical change while it is actually being carried out; and when the first section of such a station is put in hand, no one can say what the next section will be like. Great changes, too, have taken place in the development of water power, though there is less scope for improvement in this field.

Close attention is being given to the natural resources of power that the nations have at their disposal, and to the availability of those stores of energy. The industrial greatness of this country was built up on a foundation of cheap coal, and the position of a nation in the world-scale tends more and more to depend upon the utilisation of its own resources for the production of power; hence the strenuous efforts of Italy, Switzerland, and other countries which have scanty fuel supplies, to develop the waterfalls with which they are endowed.

Truly there is a vast field for the Conference to till, and we look forward with confidence to a rich harvest from the seed sown this fortnight at Wembley—and that not only in the technical aspect, for the opportunities afforded for social intercourse between the representatives of thirty-nine nations during this Conference and the tours which follow it cannot fail to lessen the distance between them, to broaden their views, and to create new friendships. This great conception which we owe to Mr. D. N. Dunlop, director of the B.E.A.M.A., will form a landmark in the history of engineering, and will almost certainly become the first of a series of international conferences by which the work will be carried on and co-operation will be promoted on the widest possible scale.

**Our Electrical Trade with India.**

INDIA brings us so large a part of our electrical export trade that we do well to follow the course of business so far as that is possible from the statistical records that are officially placed at our disposal. In the ELECTRICAL REVIEW for June 20th we published the detailed figures showing the increases and decreases in various classes of electrical products during the year 1922-23. There has since been forwarded to the Department of Overseas Trade by Mr. T. M. Ainscough, H.M. Senior Trade Commissioner in India, a survey of the import trade for the year ended March, 1924.

An examination of the comparative figures of the imports from this and other manufacturing countries indicates that during the period referred to the position did not undergo any particular alteration. Speaking generally, it might be said that things reached low water mark and that they have now begun to mend. Obviously the most suitable time for British electrical and allied representatives to strengthen their hold on the market is when there is a revival of purchasing activity.

Of the total imports during the above period the British share fell from 60 to 58 per cent., while the United States supplied 5½ per cent. and Japan 6 per cent.—reflecting practically no alteration as compared with the year ended April, 1923. The German share advanced from 5 to 5¼ per cent. Most Indian importers were busy finally clearing off old stocks and settling outstanding accounts against dealers. Their purchases were on a most limited scale and, doubtless, that is the reason why low water mark was reached. The improvement that has set in began quite gradually, but probably it is all the better for that.

If we turn to the engineering and electrical trades we have to remember that there has been a steady reduction in the imports into India of machinery and millwork every year since the boom period of three years ago. The past year witnessed further heavy liquidations of local engineering firms which were formed during the boom, but which, as so often happens after booms, could not stand up against the following depression. Shipments of machinery and millwork from this country and the United States fell, and even those from Germany shrank from 78 to 43 lacs of rupees in spite of the depreciated mark. Electrical machinery imported from all countries fell from Rs. 256 lacs to Rs. 222 lacs; the only substantial advance was in mining machinery, which grew from Rs. 40 to 108 lacs.

It is important to note that American competition was more keenly felt in electrical machinery, the share of the United States rising from 34 to 41 lacs as against a reduction from 199 to 164 lacs in the British imports. The British share of the total electrical trade remained at approximately 85 per cent., but our reduction (35 lakhs), was more than the total reduction, while the American imports advanced as stated. When we come to examine another electrical class, however—electrical instruments and apparatus—we find a better position both with regard to aggregate and to United Kingdom figures. The total imports therein advanced from 216 to 226 lacs; the United Kingdom more than maintained its position with 172 lacs, while imports from America were stationary at 18 lacs, and those from Italy and Germany fell by 5 lacs in each case. Taking the two electrical classes together, it will be seen that we sent 35 lacs less in one case and 10 lacs more in the other.

**The General Electric Million.**

THE General Electric Company, Limited, has an issued capital of £9,139,575 — including £3,427,600 seven per cent. mortgage debenture stock—and as this large sum is employed in producing practically the whole range of electrical manufactures, the annual report of its directors possesses interest for everybody connected with the industry. The company began its year on April 1st, 1923, with £174,121 brought forward, and the accounts now before us show that it has carried forward to the year which began on April 1st, 1924, a substantially larger sum—£212,452. In last year's statement the net trading profits were shown to have increased by nearly £200,000, notwithstanding the effects of the protracted lock-out in the engineering industry and the paralysis of trade in the summer of 1922. On the present occasion there is a further increase of £84,075 in net trading profits earned, making the total £835,561, and adding to this the £174,121 brought in from the previous year, the amount at disposal is well over the million mark. This is a magnificent result, and one upon which the company, which has long been so deeply rooted in the British electrical industry, is to be congratulated. The allocations to depreciation and pension funds are about the same in the two accounts, as are also debenture stock interest (7 per cent.) and the 6½ and 7½ per cent. dividends on the two classes of preference shares. The ordinary shareholders are not yet favoured with a return to the ten per cent. dividend days, the position only permitting of 5 per cent. as in the previous year. £2,000,000 ordinary capital receives this modest rate of dividend. The bulk of the capital is in the form of debentures and preference shares which receive higher rates of interest due to the unpropitious financial conditions prevailing when a large part thereof had to be issued. The increase in the amount carried forward will probably improve results at the end of the current year when the award of the Mixed Arbitral Tribunal will also show some effect.

In last year's report the number of General Electric employés was returned at 15,000—which was described as "approaching the normal figure"—the increase being due to "greater activity." The present report shows that further "greater activity" has added 2,000 more, so that the number now exceeds 17,000. The improvement in trade was less substantial than the directors expected from the efforts made. While there was a steady expansion in the demand for general electrical commodities, disappointing results were experienced in the heavy engineering department due to low prices and other adverse conditions. The company is strong in its overseas connections and subsidiaries, but its export trade has not yet regained its normal vitality, though there are signs of recovery.

# The World Power Conference at the British Empire Exhibition.

THE first World Power Conference, promoted, on the initiative of the Council of the B.E.A.M.A., with its director, Mr. D. N. Dunlop, as organising director, by National Committees in twenty countries, and with the co-operation of as many more, was opened on Monday last in the large Conference Hall at the British Empire Exhibition, with an official reception by the President, the Earl of Derby, K.G., supported by the heads of delegations and the British Reception Committee.

H.R.H. the Prince of Wales, President of the Exhibition, was present and addressed the Conference. In the evening the official banquet was held, Lord Derby presiding, and on Tuesday the Conference settled down to work, the morning session being devoted to the study of "British Empire and U.S.A. Resources," with Sir John Snell (Chief Electricity Commissioner for Great Britain) in the chair, and the afternoon to the "Resources of European, Asiatic, and South American Countries," with Dr. Geo. Otis Smith (U.S.A.) in the chair. On Wednesday, according to *World Power*, the subject was to be the "Economic Aspect of Power Resources—Economic and Financial," Sir Robert Horne presiding, the same subject being considered on Thursday morning in connection with legal and Government policy, under the chairmanship of Ing. Renzo Norsa (Italy). On Thursday also, in a separate hall, "Steam Generation—Utilisation of Fuels" was to be discussed, with Mr. W. H. Patchell (Great Britain) presiding in the morning and Dr. A. F. Enström (Sweden) in the afternoon; and the "Preparation of Fuels—Fuels Generally and Coal," under the chairmanship of Dr. D. S. Jacobus (U.S.A.), and Mr. B. F. Haanel (Canada), and "Water Power Production—General" with Mr. Arthur Surveyer and Dr. F. A. Gaby (Canada), as chairmen, were to be dealt with. The American Committee was to give a dinner at the Hotel Cecil in the evening.

To-day, the subjects and chairmen are: "Water Power Production—Civil and Mechanical Engineering, and Operating Conditions" (Mr. S. Kloumann, Norway, and Dr. Ed. Tissot, Switzerland); "Steam Utilisation" (Mr. J. W. Lieb, U.S.A.); "Preparation of Fuels" (Ing. Oskar Taussig, Austria); "Illumination" (Dr. A. Russell, Great Britain); and "Power from Other Sources" (Mr. T. C. Thomsen, Denmark). The Canadian National Committee is giving a luncheon to-day.

The sittings will be resumed on Monday, the subjects being: "Power Transmission and Distribution," and "Power Stations and Transmission Lines" (Mr. J. R. Freeman, U.S.A.); and "Gas and Fuel Section" (*sic*) (Mr. D. Milne Watson, Great Britain), the Gas and Fuel Section luncheon taking place at midday. On Tuesday "Power Transmission and Distribution" will be further discussed, under the heads of "Cables and High-Voltage d.c. Systems" (Dr. S. Z. de Ferranti, Great Britain); other subjects are: "Internal Combustion Engines"; "Power in Industry" (Mr. Bellaar Spruijt, Holland); "Power for Road and Air Transport" (Sir Charles Morgan, Great Britain); and "Research" (Dr. R. A. Millikan, U.S.A.). In the evening the Italian National Committee will hold a reception and present two kinematograph films—"Natural Steam Utilisation at Lardarello" (Prince Conti), and "Italian Hydro-electric Plants" (Ing. E. Vismara).

On Wednesday the subjects will be: "Power in Domestic Use and in Agriculture" (Mr. J. Bache-Wiig, Norway); "Power in Electrochemistry"; Industrial Welfare" (Ing. Oskar Taussig, Austria); "Power for Rail Transport" (Mr. Roger T. Smith, Great Britain); "Power in Electro-Metallurgy" (Mr. John Murphy and Mr. O. O. Lefebvre, Canada); and "Publicity" (Mr. Frederick R. Low, U.S.A.).

Thursday's programme is as follows: "Power for Rail Transport" (Prof. Luigi Lombardi, Italy); "Power for Water Transport"; "Education, Technical and Commercial" (Mr. F. V. Hansen, Sweden, and Prof. J. W. Roe, U.S.A.); and "Standardisation" (Sir Archibald Denny, Great Britain). On Thursday afternoon the Kelvin Centenary celebrations will commence with the presentation of the Kelvin medal to Prof. Elihu Thomson at the Institution of Civil Engineers, the presentation of addresses by delegates, and the Memorial Oration by Sir J. J. Thomson, O.M., F.R.S. There will also be a reception by the President of the Royal Society.

Friday, July, 11th, the closing day of the conference, will be spent in a "Review of Sessional Activities and Consideration of Future Possibilities" in general meeting, Mr. O. C. Merrill (U.S.A.) presiding in the morning, and Mr. Hugo Hirst (Great Britain) in the afternoon. The Kelvin Centenary Banquet will be held in the evening, with the Earl of Balfour, K.G., in the chair.

### The Official Reception.

The official reception was held in the large conference hall at the British Empire Exhibition at 3 o'clock on Monday last. Lord Derby, President of the Conference, briefly introduced the Prince of Wales, who then delivered an address of welcome in which he emphasised the importance of the occasion as the initiation of international co-operation in the development of the world's power resources. Power was the one great instrument by which man could extract from Nature the treasures that Nature offered and convert them to his use; the social structure itself was bound up with the use of power for industrial purposes. Though their individual views might differ, their discussions would contribute to harmony and economic progress, and the reports submitted to the Conference provided the raw material for a survey of the power resources of the world.

Sir Joseph Cook, High Commissioner for Australia, replying to the address on behalf of all the great Dominions, hailed with the utmost satisfaction this great gathering in the heart of the Empire. The Dominions aimed not merely to produce raw materials, but to develop all their resources; thus would the burdens left by the war be lifted. Signor Guido Semenza, vice-president of the Italian National Committee, speaking for all the Continental nations, pointed out that the ancient civilisations failed because they lacked the means to make use of power. Prof. M. Kamo, for Japan, cordially promised the co-operation of his country, and Mr. O. C. Merrill, chairman of the U.S.A. National Committee, on behalf of the United States and South America, said electricity was the greatest tool ever placed in the hand of man; the increasing use of it had brought about great economic and social changes. The history of modern civilisation was the liberation of mankind by the aid of power derived from natural sources; they should use it to reduce human labour and augment production, to increase leisure and intellectual activity. The great need of the day was contact between peoples, not Governments, that mutual understanding might result and the welfare of all mankind be fostered.

M. M. Guillaume, speaking in French at great length, heartily welcomed the holding of the Conference, and Lord Derby, in conclusion, voiced the thanks of all the nations represented to the Prince of Wales for giving the Conference a good send-off.

### The Official Banquet.

At the Queen's Hall, London, on Monday evening, the first official banquet of the World Power Conference was held. The Earl of Derby presided, and there was an attendance of 690 members and guests.

D

Lord Derby proposed "The First World Power Conference," pointing out that no one could know the limits of electricity, and expressing confidence that the Conference would produce a fund of knowledge. All parts of the world were contributing to the common good—the Conference was not called with any selfish idea; the immense work of organisation reflected the greatest credit on Mr. D. N. Dunlop and his staff.

M. M. Arbelot, vice-president of the French National Committee, responded, referring to the benefits derived from the use of electricity, and the developments in progress in France.

Mr. F. V. Hansen, chairman of the Swedish National Committee, also responding, expressed admiration of the Exhibition, which indicated the extraordinary resources of the British Empire, itself a "world power." In the development of water power his country feared no rival.

Mr. Samuel Insull, hon. vice-chairman of the U.S.A. National Committee, responding to the toast, after referring to the 5,000 millions sterling invested in electrical enterprises in the United States, pointed out that Ferranti taught them 35 years ago where to generate electricity and how to transmit it at high pressure, Hopkinson and Arthur Wright showed them how to prepare an equitable tariff, and Sir Chas. Parsons revolutionised the industry by developing his steam turbine. He was happy to respond for the country of his adoption in the country and city of his birth.

Dr. S. Z. de Ferranti proposed "Our Guests," remarking that electricity and power were identical to-day; electricity was the greatest labour-saver in the world, and improved the lot of every one.

Mr. Frank Hodges, M.P., responded, emphasising the advantages to be derived from the interchange of views for the benefit of mankind. Mr. J. G. Bellaar Spruijt, vice-president of the Netherlands National Committee, responding to the toast, said they got the best cables from this country; a three-core English cable had been working at 50,000 volts for a year in Holland.

Col. the Hon. Sir James Allen, K.C.B., chairman of the New Zealand National Committee, also responded, explaining that his Government was generating electricity from water power, and the local authorities were distributing it throughout the country.

Mr. A. M. Grier, K.C., vice-chairman of the Canadian National Committee, proposed the health of the chairman in a speech of burning eloquence and patriotism, and Lord Derby, in reply, pointed out that the speeches all sounded the same note—the benefit resulting from friendly intercourse between the representatives of the nations. Their thanks were due to Mr. Longbottom, and to Messrs. Dunlop, Rodgers, and Weekes, who had organised the Conference.

## List of Papers.

The following is a list of the papers to be presented at the Conference:—

**Section A.—National Review of Power Resources.**

1. The Power Resources of the Commonwealth of Australia and the Mandated Territory of New Guinea: Australian Power Report Committee (Australia).
2. The Development and Utilisation of Water Power in Austria: Bundesministerium für Handel und Verkehr (Austria).
3. The Coal Resources of Austria: Bundministerium für Handel und Verkehr (Austria).
4. Ressources en énergie que renferment les gîtes de combustibles minéreaux de la Belgique: A. Renier (Belgium).
5. Production et consommation d'énergie en Belgique—Bilan calorifique du pays: M. Delmer (Belgium).
6. Energie hydraulique belge: Am. Fontaine (Belgium).
7. The Water Power Resources of British Guiana: H. N. G. Cobbe (British Guiana).
8. Water Powers of Canada—their Nature, Extent and Administration: J. B. Challies (Canada).
9. Fuel Resources of Canada and their Utilisation for the Production of Power and other Purposes: B. F. Haanel, B.Sc., M.E.I.C. (Canada).
10. Review of the Natural Sources of Energy and their Use in Czecho-Slovakia: Masarykova Akademie Prace (Czecho-Slovakia).
11. The Water Power Resources of Denmark: A. Carstensen (Denmark).
12. The Water Power Resources of the Dutch East Indies: A. Grootthoff, A.M. (Dutch East Indies).
13. Fuel Power in the Dutch East Indies: D. J. L. Coninck Westenberg (Dutch East Indies).
14. Les Ressources d'énergie en Finlande et leur exploitation: Le Bureau d'Etat des Forces Hydrauliques (Finland).
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*(To be continued.)*

# An Electric Cooker—Some Experience, Figures and Facts.

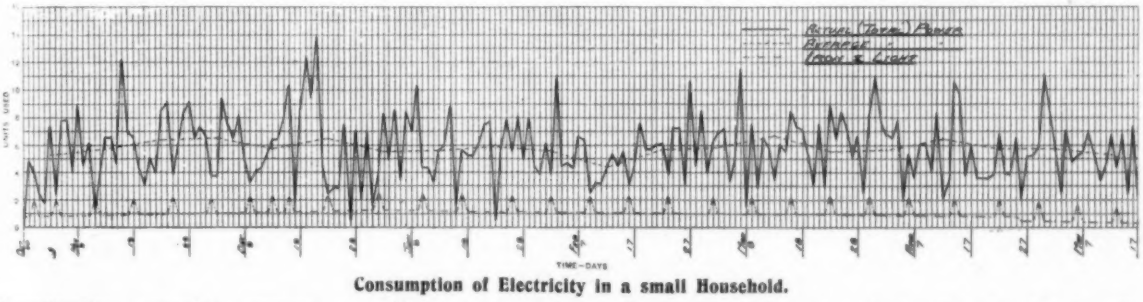
By E. G. ROSS, A.M.I.E.E.

MUCH endeavour is now being made to push the sale or hire of electric cookers, and rightly so. However, it is unfortunate that there exists among salesmen a lack of knowledge regarding the actual capabilities of such devices. One is invariably told, on "going to see about it," that "You will find it so very much cheaper than gas," or "It has been proved by experience that it is cheaper and better to cook electrically than in any other way." That these statements are true, the following details will show, but the trouble is that when the prospective customer demands actual data to suit his own family, he is generally answered: "Oh! well, you know, we cannot give you actual data, but we estimate that you would use ( ) units per annum, which would cost you £ ( )." This is a highly unsatisfactory statement and one which tends to condemn the cooker in the customer's mind. It is quite useless to make such statements unless they are beforehand prepared from an actual similar case. There are so many factors to be taken into account, that any statement so made is, as likely as not, quite inaccurate. Many non-technical friends of the writer have been misled in this respect, simply due to the fact that they thought it was only necessary to switch on when required, and the bill over the year would be cheaper than the gas bill. A sad disillusionment followed, naturally, and they feel now that the cooker should never have been installed. Also, they feel sore! As the writer had not experienced their troubles, tactful investigation revealed, around a wider circle of acquaintances, that they also suffered similarly, and further, that the gas companies, generally, were booming the same complaints to their utmost. From these circumstances it was considered that it might be fairly inferred that complaints of the kind were fairly common, and this was substantiated by inquiry at a certain supply undertaking's offices.

Now, this state of affairs should not, obviously, obtain, and it is depressing to think of the immense amount of potential business which must be passing by through the spread of splenetic individual disappointment, and with this in mind the writer made careful observation over the period October 30th, 1923, to current date, on his own cooker and its working with a view to getting hold of some data which might be regarded as reasonably definite. If this has been accomplished, these remarks will help to fill a want. But here let it be said that it is one thing to say: "We must educate consumers *to use* the cooker," and quite another matter to say: "We must educate them to use it *economically*." As far as can be seen, the latter aspect of the matter is scarcely given *serious* thought by salesmen, and, what is more, this aspect is *the one which appeals to the housewife*. The latter, as a whole, is fairly particular as to where money is spent on necessities, and if she cannot economise with a *new* thing, then it might as well be scrapped, especially if this new thing be considered, as it *is*, along with an inherent suspicion and fear of electric shocks. As an aid, therefore, towards the elimination of the trouble, the following information is given as being obtained first hand, and in order that it may be appreciated at its proper value, it must be considered from all points of view, *i.e.*, food consumed, type of consumer, &c. The information relates to a house wherein two mouths only have to be satisfied (*i.e.*, a married couple). The living is in Scottish fashion, and the average meals taken are as follows, only that part of them requiring cooking being stated:

| | |
|---|---|
| Breakfast ... ... | ¼ lb. ham;<br>3 eggs;<br>pot of tea;<br>4 slices toast;<br>plates heated in oven. |
| Dinner (mid-day) ... | 6 to 8 oz. meat;<br>1½ lb. potatoes;<br>1 small cabbage;<br>Swiss tart (1 lb. wt.);<br>pot of tea;<br>heating of plates. |
| Tea ... ... ... | pot of tea;<br>½ lb. fish;<br>heating of plates. |
| Supper ... ... | pot of tea. |

In addition to this, as an average, two pints of water are boiled for washing dishes when hot water is not ordinarily available, *e.g.*, just after breakfast. Referring only to two mouths, the above does not allow for entertaining, regarding which a remark is made later. Also, skilled attention was *continuously* available for instructional purposes, &c., which it is important to note, as an allowance must be made for the non-technical user is estimating the probable bill. The writer finds that on his own experience here set down, a figure of 1.8 might safely meet the least technical consumer, the average being about 1.4; these figures are garnered from the perusal of actual bills of non-technical users.




**Consumption of Electricity in a small Household.**

The cooker used is a 7-kW maximum demand appliance, comprising—

One 2,000-watt boiling plate.
One 1,500-watt boiling plate.
One 1,500-watt grill.
One 2,000-watt oven.

With the exception of the grill, all parts are controlled by three-heat switches, *i.e.*, full, medium, low and off. A 3-pint, 800-watt kettle is supplied with the cooker as part of the hire (three pints when completely filled).

Referring now to the graph, this shows—

1. The total actual power consumption over the given period.

2. The average consumption (inclusive).

3. The external consumption (*i.e.*, lighting, and iron used at fairly regular intervals of 8-9 days).

It is necessary to separate these three figures since, in the case considered, a single meter recorded the total power consumed in the house. Hence the lowest curve (lighting and iron) is plotted on an average basis found by observation (time) and calculation. It may be in some places 5 per cent. out, but, considered in relation to the total power, this is negligible. On the other hand, a good housewife wants to know in what manner the use of a cooker will affect her *total* bill. This can be gleaned at once from the curves given. It will be seen that the cooker load, plus 400 units per annum, will give a good preliminary estimate of the total bill on the basis under discussion (*i.e.*, 400 units for lighting and ironing as a maximum). Again, there are several very decided peaks in the curve. These indicate days on which entertaining was done. The ratio of the maximum value of peaks to the average value is 14/5.78 (5.78 units per day being the average over the whole period), which equals 2.42—say, 2½. On this occasion 12 mouths were cooked for (fish and general baking). It will be seen that, whereas the food cooked was multiplied by 6 approximately, the average power consumed was only multiplied by 2½. This is ample evidence of the efficiency of the electric cooker when cooking for a large number of mouths at one time. The average value of the total power consumed varies between 6.8 units per day and 4.3 units per day, and that in an approximately cyclical manner. Why this should be so is not yet apparent, since the rough maxima do not necessarily coincide with periods of entertaining. At any rate, since the average consumption over the whole period is 5.78 units per day, it is a safe figure to take three units per head per day as the basis of the bill in the present case. Multiplying this by the aforementioned allowance factor for unskilled usage, a fairly rational basis may be reached for most cases. This allowance factor must vary at least between the limits mentioned (*viz.*, 1.8 and 1.4), perhaps more, but an experienced man should have no difficulty in placing his client properly. Indeed, that is one of his duties. The question of breakdowns and attendant service will, in the long run, fix reasonable values for the multiplier, since where cookers are supplied with a service, accurate records may be, and are, taken of breakdowns, &c., which are generally fairly proportional in number to the lack of "electricality" of consumers, so that the allowance factor may be finally definitely fixed.

One would have thought that a decided maximum would have been shown over December and January, but this is hardly the case. As the summer comes in, the average falls a little, but not so much as one would expect, as any fall is largely due to the decrease in lighting consumption. This would appear to indicate than no more food is consumed in winter than in summer, since it must be borne in mind that no departure from the ordinary mode of eating was caused by changing over to the electric cooker.

Now, with regard to costs, the basis of charging varies in all localities, but where the cooker in question is installed, the charge is a two-part one. There is a fixed charge of 2s. per week, plus ½d. per unit, for *all* energy consumed, provided that the average does not fall below ¾d. per unit. The latter value can only apply to very large consumers, say, not less than the equivalent of nine or ten mouths per meal per day. For such consumers, on the basis of the foregoing, it is comparatively easy to estimate the probable consumption in each case. Where $x$ represents the number of mouths to be fed, then the probable consumption will be $[6$ units per day for 2 mouths, plus $2.5/6 \times (x-2)/1 = 6 + .42\ (x-2)]$ units, say, *i.e.*, for 10 mouths, 9.36 units per day, this being multiplied, if necessary, by the correcting factor aforementioned. In the present case the fixed charge works out at 3.428 pence per day, to which is added 5.78 units at ½d. = 2.89 pence per day, making a total of 6.318 pence per day, or just on £9 12s. 6d. per annum. In addition to this, the hire charge of 10s. per annum for the cooker must be allowed for, giving a grand total of just over £10 per annum. This is very interesting in that the annual bills on the old basis worked out at—

| | |
|---|---|
| Gas for cooking ... ... ... ... | £8 14 10 |
| Electricity at 4½d. per unit for light and iron ... ... ... ... ... | 5 3 0 |
| Total ... | £13 17 10 |

A saving of nearly £4 per annum is thus effected, but it must be borne in mind that in many cases this saving could not be effected, simply because people acquainted with a gas cooker are not necessarily able to use the electric cooker right off just so economically. Thus, when the aforementioned multiplying factor is brought into play, it is patent that in many cases there will be no saving at all in the total bill, and however much salesmen may harp on incidental economies obtainable with the electric cooker (of which more is said below), the main thing that tells is the effect on the total bill for the year. The complete cure is, of course, to cheapen the rate per unit.

That it *is* necessary to keep on pointing out the incidental economies is readily recognised from the foregoing. The difficulty is, however, to do so in terms of £ s. d. The following points are not based thus, but may be found of value in making an appeal to the feminine mind. In the case considered it was found that meat could be reduced in quantity bought per meal from 8 oz. to 6 oz. in the case of mince, steak, liver, sausages, corned beef, &c., and from 10 oz. to 8 oz. in the case of chops, roast beef, and pork. This is a 20-25 per cent. saving, not to be ignored in these days at all, as all will agree. Put in another form, it means, roughly, that what previously fed four mouths now feeds five. Again, two similar ½-lb. quantities of filleted fish were cooked (fried) one by gas and the other electrically. The results were, when both were cooked—

| | |
|---|---|
| Weight of gas-cooked fish ... ... | 5⅝ oz. |
| Weight of electrically-cooked fish ... | 7 oz. |

Gas-cooked fish was dry and shrivelled.

Electrically-cooked fish was just too juicy.

Gas-cooked fish was burnt round the edges.

No such burning was indicated with electrically-cooked fish.

The entire lack of grease (external) and smell attendant on the use of the electric cooker now lends a definite pleasure to the cleaning up after a meal. It is only necessary to rub down the cooker with a cloth moistened with olive oil, a saving in labour which has only to be experienced to be fully appreciated.

Then, again, with regard to baking, a much more satisfactory job is made, and that with a similar saving. Two apple-cakes were made out of the same rolling of dough, placed in exactly similar dishes and cooked, one by gas, the other electrically. The final results were—

*Electrically-cooked cake.*—Evenly browned and smooth on top; no part burnt in the least; final thickness 1½ in.; paste crisp, yet not dry; no sticking to tin; no sign of apple-juice externally.

*Gas-cooked cake.*—Unevenly browned and much whiter than the other; top blistery and nearly burnt in patches, although not overdone; thickness 1 in.; paste decidedly "doughy," sticking to tin in places; apple-juice overflowed and formed a toffee-like substance.

With cakes of the "Madeira" type, it was noted that the electrically-cooked cake had no tendency to burn on top, and was of the same consistency all through, whereas the others were blackened on top and decidedly hard round the sides and bottom.

The *facts* cannot fail to impress any prospective user of an electric cooker, and they represent true economies in operation. The disposition of the heating elements is such as to give a very fine even heat not obtainable with any other kind of cooker, and this alone is worth many cubic feet of gas, as has been proved. If all these advantages could be converted into terms of £ s. d. on paper, then the case for the electric cooker would be firmly established once and for all.

With regard to the proper use of the cooker, there are some points to be noted. The main thing is to learn

to switch off at the *correct time*. The gas cooker loses much heat by direct loss up the sides of the pot. A similar quantity of heat *can* be lost with the electric cooker if it is not borne in mind that the firebrick supporting the elements becomes red hot very quickly in use, and if the user switches off *after* removing the boiling pot, or *after* the food is cooked, then this heat in the brick will be lost. For example, a pan of water brought to the boil, and the heater kept full on for two minutes thereafter, *boiled* for 4¼ minutes after switching off. As the total time to bring it to the boil was just on 15 minutes, it will be seen that it is possible to save at least 20 per cent. of the power ordinarily used by judicious switching off. A point of criticism might here be advanced against the average electric cooker respecting the heating of pans smaller in diameter than the heating element. Here it is very wasteful to use the heater full on, as much heat escapes up the sides of the pan, and in the case cited only the medium heat is used for this purpose, this heat simply being half of the heater full on, the other half being dead. This in itself is not fully satisfactory, as a space is left for heat to escape. If some form of asbestos screen could be arranged to be easily drawn across the dead half of the element, then the medium heat could be used very efficiently indeed for boiling small pans, &c., and as these pans are probably the most frequently used, a marked saving in power would result from the use of such a screen. As it is, when water only has to be boiled, it is much quicker and cheaper to use the electric kettle. Two pints boil in 9½ minutes in an 800-watt polished copper kettle, *i.e.*, 3,800 watt-minutes per pint, as against 18½ minutes for four pints in a plain polished aluminium kettle heated on the 1,500-watt boiling plate (*i.e.*, 6,937.5 watt-minutes per pint). *The difference* of 3,137.5 *watt-minutes per pint is* 82½ *per cent. of the energy necessary per pint for the electric kettle*. This seems incredible, but it is the case. Obviously, makers require to look into the better design of boiling rings! It is only fair that this should be pointed out to the consumer, as, water being the most frequently heated liquid, it is conceivable that this is where the greatest energy loss might arise. This is substantiated by the fact that those friends of the writer who use no electric kettle find their electricity bills inordinately high. Similarly, when a long boiling (corned beef, say) is required, the user should be carefully advised that the full heat should *only* be kept on for a short time after the pot comes to the boil, and then reduced to medium for a period, finally being cut down to low. This is simply the result of the working of well-known physical laws of heat input and loss, and should be duly indicated. Exactly the same conditions apply to the oven, probably more so, as it was found that the oven, once fully hot, when switched off and the door kept closed, remained so for a long time, and at the end of four hours plates could be put in and heated up for a meal without further switching on. This, of course, is due to the fact that the electric oven is completely closed in (except for the small louvre in the door), whereas the gas oven, requiring a current of air for the proper burning of the gas, must necessarily be open somewhere. It will be seen, then, that when baking, it is wasteful *not* to switch off some time before the cake is done. There is one thing which must *not* be done, however. It is customary with many people to dry damp firewood in the oven after baking, and this was inadvertently done once in an electric oven to the writer's knowledge. The sticks contained more moisture than appeared to be the case, with the result that, the oven being closed, vapour condensed and earthed the elements (blowing the fuses), through a pool of water collecting among the bead-insulated leads to and from the side elements. But for the disposition of these leads in the lower corners of the oven, no trouble would have ensued, as the elements themselves were more satisfactorily supported away from the walls. Perhaps makers might take the hint as a step towards rendering their cookers more fool-proof. Similarly, users should be warned to prevent things boiling over. Coffee, milk, and egg boiling are the chief offenders. No harm is generally done to the elements, but the resulting wait on "the man coming" is annoying, which, of course, indicates the safety of the cooker. The worst harm that may be done to the operator is that a slight shock may be felt, due to surface leakage when things do boil over, but as the cooker circuit is duly protected by good earthing, this is not serious. At any rate, it is less dangerous than a "blow-back" in a gas oven.

This point raises the question of service. The writer has found that this is quite satisfactory in his district. A 'phone message is all that is required to bring out the man with a replacement fuse or element, and no question is raised. As well as paying, necessarily, for part of the cost of supplying electricity, the standing charge covers this service, but it is thought that this charge operates unduly heavily on the technical user. For example, three breakdowns (fuses blown) occurred over the period cited. On the basis of 2s. per week standing charge, this means that the *apparent* cost per repair is 58/3s. = 19s., roughly; the man's time was not of much account (about an hour), and it must be noticed that the average figure per unit must not fall below ¾d. This figure obtains when the consumption reaches 13.5 units per day, or 2.33 times the normal. That is to say, even at the latter figure the supply authority can afford to repair free under the terms of the contract. Since the average user is very probably a family of four, it will be seen that a very good margin is available for the supply people to cover their various oncosts and certain profits. Apart from this, however, the main thing is that the average consumer will, and very probably does, consider that the standing charge covers her *repairs only*. She will care little about overhead costs, or the like, if the bill is worked out on the basis of the number of "breakdowns" divided into the amount of standing charge over a given period. The direct unit charge part of the two-part tariff is always accepted without question, but the other part is generally regarded with suspicion by the non-technical user. The case for the inauguration of some kind of rebate system is therefore of strength, and this might be arranged so that if a certain number of breakdowns were not exceeded, a reduction, *pro rata* or some such, ensued in the standing charge, then nothing more could be desired in respect of attendant service. On this basis, of course, deliberately careless users would pay more, which would only be fair. The trained user must always pay the supply company best in this respect, and therefore should be materially encouraged.

Space forbids further remarks. Suffice it to say that it is sincerely hoped that the foregoing will be found useful to all interested, and to the selling or hiring agent in particular. The electric cooker has a great future in store, but to realise this in full, the spade work must be done properly and methodically, and last, but not least, *honestly*.

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**Canadian Molybdenum.**—The High Commissioner for Canada in London has received from the Dominion Department of Mines at Ottawa an article prepared by Mr. V. L. Eardly-Wilmot, of the Mines Branch, on the subject of molybdenum, which has many uses, such as in electrical appliances, as a substitute for platinum, and as an alloy in steels. During the war the Mines Branch of the Department of Mines, Ottawa, acted as Canadian agents in the buying of ores and concentrates, and treated many thousands of tons of raw molybdenite ore from all over the Dominion. Before the war production in Canada was practically nil, and there were very few known deposits of the mineral, but the demand led to so much activity that there are now about 350 recorded occurrences. In the peak year of 1918, Canada became the second largest world's producer of molybdenum. Most of the output came from a deposit at Quyon, Quebec, thirty miles west of Ottawa, which for some time was the world's leading individual producer. During the war period molybdenite was mined from 110 different properties, from 30 of which over five tons of ore were shipped or treated. Molybdenite occurs in practically every province in Canada, but the greatest number of known deposits lie within a wide 150-mile belt to the west and south of Ottawa.

# Supervising Systems for the Remote Control of Unattended Sub-stations.

By C. J. SARJEANT and T. N. RILEY, M.Sc., A.M.I.E.E.

OWING to the rapid growth of power networks and the increasing interconnection of generating stations, it is becoming the practice to place the operation of the whole system under the control of one load dispatcher located at a convenient central position In order that he may exercise his functions satisfactorily, it is necessary that he should have exact information as to the position of all operating units at any time. With this knowledge he can direct the operation of each part of the system in order to obtain the greatest efficiency of the whole. When reports and operation instructions are transmitted by telephone, there is delay in operation and possible misunderstanding at times of emergency when speed and accuracy are of vital importance and when any wrong switching may result in considerable damage to the plant. The supervisory systems briefly described in this article have been developed to eliminate the human element, and to indicate automatically to the local dispatcher the exact position of all operating units in the system; and, in certain cases, to place it within his power to operate them directly.

The systems have also a most useful field of application in automatic sub-stations which have made it possible in all fields of electric power generation and transmission to replace large hand-operated sub-stations by a larger number of smaller automatic stations located at more convenient load centres. The use of automatic sub-stations, besides reducing the operating cost, gives a more flexible power system, especially if the whole is controlled from a central point. Supervisory control may be applied here, either for indication only so that the central station operator may know that the automatic station is functioning properly, or for putting the station in or out of commission through a master controlling device.

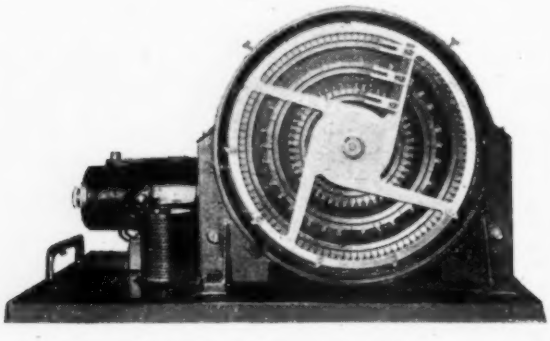

**Fig. 1.—Western Electric Distributor.**

For such services reliability is most essential, and it is therefore desirable that the system should contain as few moving parts and contacts as possible, and that such as are used should be mechanically robust and require little maintenance. These requirements have been met in the systems described below, where apparatus already proved reliable over a period of years in the Western Electric printing telegraph and train dispatching systems have been used.

To meet service conditions, three distinct schemes have been developed, each having its particular application. These schemes differ mainly in the method of transmitting the controlling signal between the stations rather than in the method of operating apparatus at the terminals. They were designed to meet the following conditions:—

(*a*) A condition where the power system contains a large number of power units located in an outlying station a considerable distance away from the central station. This condition was met by a system using motor-driven distributors and associated apparatus with four connecting line wires from the central station to the outlying station.

(*b*) A condition where the power system contains several outlying stations spread over long distances with a small number of power units located in each. This condition was met by a system using standard selectors, selector keys, and motor-driven selector keys with three continuous connecting line wires from the central station to all of the outlying stations.

(*c*) A condition where the outlying stations are located within such a short distance of the central station that it is preferable to install standard telephone cable using one or two wires per switch between the stations rather than to employ the distributor or selector system for transmitting the signals between stations.

### (a) Distributor System.

The distributor type control and indicating system has been developed to meet the conditions outlined in paragraph (*a*). The apparatus required in the load dispatcher's office consists of a panel on which the necessary control switches and lamps are mounted, a cabinet containing the relays and distributor, a battery or motor-generator set giving + or − 60 volts for relay operation and a 24-volt battery for the indicating lamps. At the distant end of the circuit the relay cabinet and the + or − 60-volt supply only are required.

On the upper part of the control panel in front of the load dispatcher are mounted a series of unit control keys and indicating lamps, one of each power switch to be operated. This panel is designed to accommodate a maximum of 50-unit switches in five rows of 10 each. Each unit consists of a control key, circuit label, and three indicating lamps; a red lamp which lights when the distant power switch is closed, a green lamp which lights when the power switch is open, and a white lamp which lights whenever the position of the distant switch does not agree with the position of the control key. Below the control units is a section on which are mounted fault indicating lamps and a master control key, which are common to all units. All these switches and lamps are permanently wired to a series of terminating strips at the foot of the back of the panel to which external connections can be made. From the main control panel connections are made to the cabinet containing the relays and distributors. The interstation connections between the two relay cabinets consist of four wires only, which may either be overhead or may be taken from any existing telephone cable between stations. One wire is required to operate the distant switch, one to give an indication back, one to transmit the impulses keeping the distributors in synchronism, and one forms a common return.

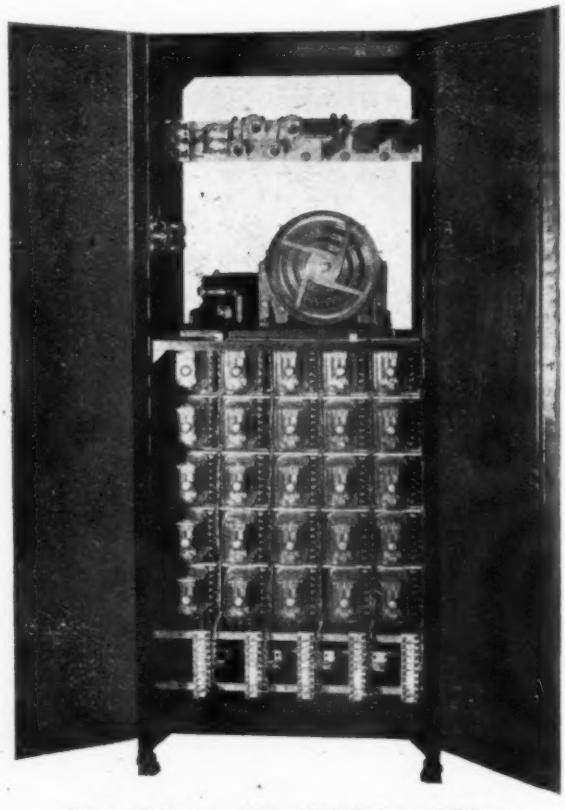

**Fig. 2.—Cabinet containing Distributor and Relays.**

Suppose the feeder switch at the sub-station is open; the corresponding unit indicating lamp will show green. If it is desired to close this feeder switch, the operator has only to close the control key and then his master key. The white indicating lamp at once lights up, since the key and switch positions no longer agree. Within five seconds—the time of one revolution of the distributor—the operation will be completed. An auxiliary contact on the feeder switch will transmit an impulse back, changing the indicating lamp from

green to red and extinguishing the white lamp. If this feeder switch comes out on overload, the white lamp will at once light up, indicating operation, the indicating lamp will change from red to green, and an alarm bell will ring to call the attention of the operator. Although the control key is still in the "on" position, the power switch will not be reclosed on the next revolution of the distributor even if the master control key is operated, since the opening of the power switch will also open an auxiliary contact in the circuit of the closing coil, and this can only be restored by returning the control key to the "off" position to agree with the position of the power switch. The provision of a master control key enables the operating line circuit to be kept open in the normal position so that no switches can be operated by accidental line contacts with other power circuits.

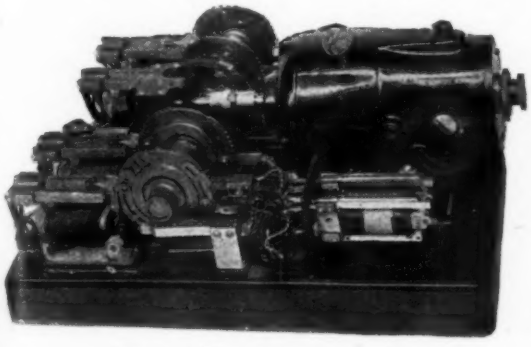

**Fig. 3.—Automatic Sending Device.**

A special feature of the apparatus is that there is no uncertainty as to the position of the power switches, as this is continuously checked back on every revolution of the distributor. The distributors are automatically kept in synchronism, and provision is made to ring an alarm signal in case of failure of the synchronising gear or in case of line faults. Should the battery supply fail, all power switches will remain in their existing positions and no false operation can take place. The number of contacts to be made on any operation has been reduced to a minimum, and all relay contacts are large and have ample contact pressure to ensure reliability. The relays are totally enclosed in glass covers.

**Fig. 4.—Operating Cabinet.**

If the system is used for indicating only, it is then possible to obtain position indication of 100 switches instead of 50 for each pair of distributors.

### (b) Selector System.

When there are few switches at each of a number of stations at a considerable distance apart, the large number of operating contacts on the distributor are not required and it is also an advantage to reduce the number of interconnecting lines. To meet these conditions, the Western Electric train dispatching system has been modified by the addition of an automatic sending device at the distant station. In this system only three line wires from the central station through all substations are required for operation.

The apparatus at the load dispatching station consists of a cabinet containing control keys and indicating lamps, a cabinet containing the auxiliary apparatus for the sending and receiving of signals, one 144-volt battery for relay operation, and one 24-volt battery for the indicating lamps. At the distant end of the circuit a cabinet containing the auxiliary signal apparatus and a 72-volt battery are required at each of the sub-stations.

The operation is generally similar to that employed in the distributor system except that a separate key is required for each operation, *i.e.*, one key for opening the switch and a second key—sending a different line impulse—for closing it. The equipment is so interlocked that no incoming signals can occur while sending and only one indication can be sent at a time. Should all breakers open simultaneously, the impulses will be stored up, and will be sent in a definite order to the dispatcher's office. In this respect the selector system is not so fast as the distributor system, where the operation of all switches simultaneously can be signalled back within five seconds. In order to call the operator's attention to incoming signals, a pilot lamp is lit on the top of the operating cabinet and an alarm bell is rung.

### (c) Cable System.

When the station to be controlled is very close to the load dispatching station, it may be cheaper to dispense with either distributor or selector and use multiple conductor telephone cable between the points. In this case one wire per switch is

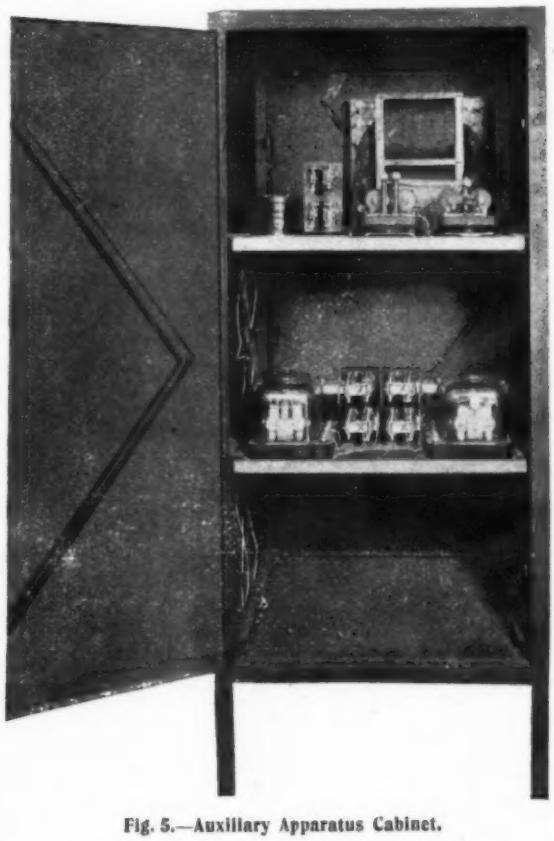

**Fig. 5.—Auxiliary Apparatus Cabinet.**

required for control and one wire per switch for indication, together with the common return as before. The relays are then operated directly, the terminal apparatus being the same as in the distributor system.

### Installations.

The distributor system has been in operation for more than a year for both control and indication at the central station of the Maldon Electric Company, Massachusetts, and has given entire satisfaction.

For indication only, it has been used for a similar period at the Waterside station of the New York Edison Co. to show the positions of approximately 186 breakers at the Sherman Creek station. In the same load dispatcher's office the cable system has been employed to show the positions of approximately 200 circuit-breakers at the Sherman Creek station.

In both cases maintenance costs have been small, and the installations have proved so reliable under operating conditions that extensions are now in hand.

Apart from the operation of power switches, the systems can be applied to give indications of water levels, maximum temperatures, maximum loads, or any other condition which can be made to operate an electrical contact.

# Reviews.

**Fuel Economy in Steam Plants.** By ARTHUR GROUNDS, B.Sc., A.I.C., M.I.Min.E. Pp. ix + 106. Figs. 13. London: Sir Isaac Pitman & Sons, Ltd. Price 5s. net.

This little book is intended to form a companion volume to the one on "Boiler Inspection and Maintenance," by Clayton, in Pitman's Technical Primer series, and deals with the principles of combustion, the conditions affecting fuel consumption, the causes of losses in boiler plants and methods of securing fuel economy.

In the necessarily brief space at his disposal, the author has compiled six chapters dealing with the principles and practice of combustion, losses in steam plants, economisers and air heaters, boiler management and fuel economy, and boiler house instruments and records, so that the scope of the work is fairly comprehensive.

In connection with the calculations on the quantity of air required for combustion and the effect of excess air, the author considers volumes instead of the concise expression of the results in terms of weight, although eventually the losses have to be calculated from the weight of the gases and excess air in the flues. Later, reference is made to a temperature of 100 deg. F., as being the lowest temperature to which the gases could economically be cooled, but surely the author is aware that in practice this figure is not attainable, particularly as he refers to the danger of corrosion to metal surfaces from "sweating."

In a useful practical chapter devoted to boiler management, the author in considering soot deposits states that if soot is allowed to accumulate on the heating surfaces, the temperature of the flue gases at the base of the stack will be found to rise above 550 deg. F. in all probability. This statement is distinctly misleading, for the temperature of the gases at the base of the stack depends upon many variables in practice, and cannot be simply stated in a brief sentence similar to that given on p. 81.

In describing the "Duplex Mono" recorder, the author states that an average of twenty analyses per minute is made, but surely twenty analyses per hour is more usual in the "Duplex" type where both $CO_2$ and CO are analysed and then recorded on one chart.

On the whole the book should prove useful to practical men in charge of small boiler plants, although it can hardly be recommended as a text-book for technical engineers engaged in the operation of modern water-tube boiler plant.

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**Modern Power Engineering.** By A. REGNAULD. 4 Volumes. Illustrated. London: Caxton Publishing Co., Ltd. Price 78s. net.

This work consists of four volumes of approximately 250 pages each. The subject has been treated throughout in simple non-technical language, so that it shall be readily understood by those who have not had the advantage of a scientific or technical education.

The preface states: "It is hoped that these volumes will appeal to the vast number of engineers who are engaged in the care and maintenance of power-generating plants, and who have hitherto been debarred from understanding the why and wherefore of the machinery in their charge, because of their inability to understand the scientific and technical language usually found in engineering books." It would appear from this statement that engineers-in-charge are mainly composed of technically uneducated men unable to understand scientific and technical terms, and with that contention it is impossible to agree. A very large percentage of engineering text books can be, and are, read and properly understood by the majority of maintenance engineers. When engineers-in-charge can pass without difficulty examinations like those conducted by the Institutions of Electrical and Mechanical Engineers, it can hardly be said that it is necessary to teach them the principles underlying the operation of their plant.

If, as the author states, third-year students are lacking in the knowledge of fundamental principles, then the system of instruction and training adopted in technical institutes must badly need revision, and leaves a great deal to be desired.

Good and reliable descriptions of modern plant and auxiliaries can always be obtained from the technical journals, and the majority of the famous engineering firms will readily supply catalogues and literature describing and illustrating their manufactures.

It is difficult to understand what the author means when he states that text-books seldom assist students to understand the fundamental idea underlying the action of any particular engine, and it is to be hoped that it does not require a thousand or more pages to impart this knowledge.

The first volume deals in Chapter II with the classification of prime movers, and gives a broad classification of the various forms of power generators, showing the relationship which exists between the various forms in present day use. The application and development of the steam engine, Chapter III, necessarily contains a considerable amount of ancient history, together with some of the later developments. A large amount of space is devoted to the steam turbine; the information given is reliable and up-to-date, but the majority of the illustrations appear familiar, as also does some of the text.

Engine room auxiliaries, both land and marine, are considered, and here again the illustrations are known to most engineers, and a great deal of the information is easily obtainable from the various manufacturers mentioned in the preface.

The most useful chapter in the volume is the one on modern steam condensing plants. This gives descriptions of the very latest practice, and can be read with interest by all engineers-in-charge, whether they understand first principles or not.

The second volume commences with a brief historical review of the development of the internal combustion engine, and follows with descriptions of internal combustion engines of various types. Attention has been paid to the question of the use of waste materials for the generation of gaseous fuels for these engines, and reference has also been made to the problem of the production of liquid fuels from coal and vegetation.

If all the catalogue information and illustrations were removed from this volume, not a great deal would be left.

Volume III commences with an explanation of how the reciprocating engine works. The author, unfortunately, introduces some of those technical formulæ which the reader is presumably unable to understand. This volume also deals with pumping engines, land and marine reciprocating engines, water power and the steam locomotive.

The last volume gives descriptions of boilers and boiler plant, and also considers the production and combustion of coal and oil fuel.

The work consists mainly of descriptions of power generators and power plant. For those engineers who wish to possess a comprehensive description of the improvements and developments of power plant generally, and who do not wish to have the trouble of writing to manufacturers, these books can be recommended. They should not, however, be considered as suitable text-books for engineers who are lacking in technical knowledge, and who are apparently the ones the work is primarily intended for.

The volumes are well produced, but with the price asked an excellent library of books could be obtained of far more value to the engineer than these can lay claim to.

E. P.

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**Electrolytic Rectifiers.** By N. A. DE BRUYNE. Pp. vii+75. Figs 23. London: Sir Isaac Pitman & Sons, Ltd. Price 3s. 6d. net.

This volume is intended, as the author states, for the use of electrical engineers, physicists and wireless amateurs, and also as a practical guide of how to make and apply electrolytic rectifiers for charging accumulators from alternating current supply mains.

This is the first book published in the English language dealing exclusively with electrolytic rectifiers, and Mr. de Bruyne has given us a book, written with the gift of lucid expression, which describes in detail electrical operations which are of technical and practical interest to electrical engineers and physicists, and of popular interest to wireless amateurs who have to charge their accumulators off an aiternating current supply. The book is well up to date, bears evidence of careful search by the author, and written by one who is evidently at home in these matters. It should prove of assistance to all engaged in electrical industries.

Chapter 1 deals briefly with the characteristics of electrolytic rectifiers, including the principle and history of valve action, types of electrolytic, ionic and electronic valve action, effect of pressure on rectification, and the capacity and efficiency of electrolytic rectifiers. The author considers that nearly all the metals which give electronic valve action have amphoteric oxides or hydroxides. Chapter 2 gives a concise account of the theory of electrolytic rectifiers, comprising sections on the oxide film theory and various methods of measuring the thickness of films on the anode.

The gas layer theory is discussed together with ionic valve action. Ionic valve action is exemplified as those metals which when used as anodes evolve no gas, have small electrostatic capacity and no maximum voltage. Chapter 2 is perhaps the most important part of the book, the author makes several additions to the gas-layer theory of Gunther-Schulze, and states that the breaking down of the resistance beyond the maximum voltage is due to the film thickness decreasing in such an extent that the gas layer disappears, due to the fact that it has no support. A theory is also offered regarding the cause of the lowering of the breakdown voltage when the temperature or concentration of electrolyte is increased. Chapter 3 deals with rectifiers in practice and methods of connection. The operation of electrolytic rectifiers is sketched and their suitability discussed for rectifying alternating current for the plate circuit of thermionic valves. Chapter 4 deals with electrolytic lightning arresters, and more particularly with direct and alternating current lightning arresters and the various applications of the principle of valve action. Chapter 5 deals with the construction of electrolytic rectifiers. A reference bibliography is given at the end of each section, so that any particular aspect of the subject can be thoroughly explored by the reader who requires wider and more detailed information; the references are not complete, but those given are sufficient in themselves to enable cross references to be found, from which a more complete list can be compiled.

Mr. de Bruyne's book bears the impress of a writer of wide

experience and reading, and of a knowledge of the requirements of the electrical engineer and amateur wireless operator. The subject matter has been ably sifted from a large mass of scattered publications, and the book is a valuable contribution to modern technical literature. The reviewer feels confident, that, in spite of the large amount of work already done, there still remains a widening field of application for electrolytic rectifiers, and that the present book will contribute materially to the popularisation and extension of this important branch of electricity.

No one who is interested in electrolytic rectifiers will be disappointed by a perusal of Mr. de Bruyne's volume, it is readable, clear and concise. The essentials of the subject matter are presented accurately, and in an interesting manner. The diagrams are clear and well chosen, the indexing, printing and general arrangement good, and the book is remarkably free from typographical errors. This volume is to be commended as a useful summary on the subject, and one which all interested in electrolytic rectifiers would do well to consult.

The clear type and excellent paper make it a credit to the publishers, and the author is to be congratulated on its production. E. W. L.

# Correspondence.

*Correspondents should forward their communications* **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

### Protection Against Pressure Rises.

Being on a visit to the Old Country for the acquisition of information, or, in other words, a business holiday, I have read with great interest the article in your issue of June 20th, by Mr. G. W. Partridge, on "Rises in Pressure and Protection of Alternating Current Circuits," in which Mr. Partridge describes a surge protection apparatus installed in sub-stations.

It may be of interest to your readers to know that I installed a somewhat similar apparatus at Port Elizabeth, South Africa, about the year 1916. In 1919, on being appointed to my present position at Johannesburg, I found that much trouble was being experienced due to pressure surges caused by lightning. Johannesburg lies at an altitude of nearly 6,000 feet above sea level and is subject during the summer months from December to February or March, to continuous and severe thunderstorms, and lightning troubles there are said to be the most severe in almost any part of the world.

I found that in certain suburbs the trip switches at the sub-stations operated with every storm, and cable and transformer faults were of frequent occurrence, indicating abnormal pressure surges due to lightning.

I have now installed similar surge arresters, consisting of spark gaps with current limiting resistances in all the outlying sub-stations, and find that these act as electrical safety valves and that except in the case of a direct hit by lightning on an overhead line, tripped switches or punctured cables are of rare occurrence. So far I have discovered no apparatus which will stand up to a direct hit by lightning, but pressure surges from adjacent lightning storms are now terrors of the past.

Inspection of the spark gaps shows that the apparatus frequently operates even when there are no lightning storms or short circuits to account for the pressure surges, and I can recommend this type of protection to engineers who are troubled with unaccountable faults and troubles on high-pressure mains, whether connected to overhead lines or not.

This apparatus appears to act as an electrical safety valve and effectively takes care of undue rises of pressure which occur on h.t. mains often apparently without any ascertainable cause.

**B. Sankey.**

London, *June 25th*, 1924.

### A Mathematical Query.

The difficulty encountered by "H.P.M." is due to the nature of electromagnetic pull and its resemblance to muscular pull. It is almost as wearying to hold up a bag of flour as it is to lift it, and the electromagnet consumes power, from the electric circuit, while maintaining its pull without lifting. Let "H. P. M." translate the problem into a "permanent magnet" pull and then he will see that "work" is done only during the movement of his plunger. If he winds his pole pieces with wire connected to a galvanometer he will observe a swing during each movement of his plunger, although no battery be in circuit. A similar action takes place in the electromagnet, giving rise to an electromotive force opposed to the battery during inward motion of his plunger. The battery's effort to overcome this small e.m.f. is the only useful work done by the battery—after it has established the magnetic flux equivalent to that of a permanent steel magnet. In pulling out the plunger, he will send a current in the reverse direction through the coil—assisting the battery.

**E. C. B.**

*June 26th*, 1924.

### The Temperature Rise of Electrical Machinery.

While attacking a problem in heating, the following simple formula was arrived at. I am not aware that it has been published before, and it may be of interest to the readers of the ELECTRICAL REVIEW.

In a heat run, note that the temperature rises to $x_1$ and $x_2$ at two instants of time after equal intervals from the beginning of the heat run—say, after 15 minutes and 30 minutes or 18 and 36 minutes from the start. Let the times be denoted by $t_1$ and $t_2$ respectively, and let the final temperature rise be F.

From the well-known formula—

$$x_1 = F\,(1 - e^{-t_1/To})$$
$$x_2 = F\,(1 - e^{-2t_1/To})$$

When To is heating time constant, and $t_2 = 2t_1$.

Therefore $x_2/x_1 = 1 + e^{-t_1/To}$

$$\therefore e^{-t_1/To} = x_2/x_1 - 1.$$

Substituting in the first equation,

(Final Temp. Rise) $F = x_1/(2 - x_2/x_1)$.

Example:

Let $x_1$ = 20 deg. C. rise after 1 hour.

Let $x_2$ = 32 deg. C. rise after 2 hours.

Then the final temperature rise would be: $= 20/(2-1.6) = 20/0.4 = 50$ deg. C.

**T. W. Rowlands.**

Rugby, *June 27th*, 1924.

# Business Notes.

**The "Electrical Review" Index.**—The Index for the last half-yearly volume of the ELECTRICAL REVIEW (January to June, 1924) is now being printed. Copies will be forwarded post free to those requiring them for binding or for reference purposes, if they will make application at once to the Publisher, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C.4.

**Bankruptcy Proceedings.**—WM. SINCLAIR TAYLOR, "Earlswood," Winterbourne Gunner, near Salisbury, late of Redcliffe Square, Kensington.—A sitting of the London Bankruptcy Court was held on June 24th before Mr. Registrar Mellor, for the public examination of this debtor, who failed in December, 1923, with total liabilities £11,382 (unsecured £9,446) and assets "a bad debt £3,200, not estimated to produce anything." Questioned by Mr. Armstrong, Official Receiver, the debtor stated that prior to 1912 he was employed as a travelling agent for various firms in the trade. He then started on his own account as an electric lamp merchant under the style of the "Wm. Taylor Elecfric Lamp Co." at Jewry Street, E.C. In January, 1917, the business was acquired by the "Wm. Taylor Electric Lamp Co., Ltd.," of which he acted as managing director until he was required by a Military Service Tribunal to do work of national importance. Between August and December, 1920, witness and two other persons were engaged in experimenting and applying tests to electric lamps of Dutch manufacture; they decided in October, 1920, upon a lamp manufactured by the Condor Lamp Manufacturing Co., Ltd.; in the following December a business was registered in his wife's name under the style of the "B.T.T. Lamp and Accessories Co." The capital was provided by his wife, and he (debtor) acted as manager of the business. In February, 1922, an injunction was granted on the application of the British Thomson-Houston Co., Ltd., restraining the infringement of their patent, and the business came to an end. In January, 1922, witness purchased for £3,250 the lease of a factory, plant, &c., of the Aladdin Renew Lamp Co., Ltd., Harrow Road, Willesden, the purchase-money being given him by his wife. After the factory had been refitted, he sold the business to the Willesden Electric, Ltd., the consideration being £10,000 first mortgage debentures; he acted as managing director until about July, 1923, when a receiver was appointed on the application of Lloyd's Bank, Ltd., which had advanced £6,200 on the security of debentures and of his (debtor's) personal guarantee. He repaid the bank £1,900 under his guarantee, the money being raised on a mortgage upon his residence at Salisbury. His remuneration as managing director was to be £1,500 per annum, but nothing had been paid to him, and the company now was his debtor to the extent of £3,200. In August, 1923, the bank issued a writ to recover the balance due under his personal guarantee; judgment was signed against him, and these bankruptcy proceedings followed. The debtor attributed his failure and insolvency to his liability under the said guarantee, bad debts, the cost of alterations to his freehold property, and to law costs. The examination was concluded.

E

GEORGE KERSHAW (separate estate), electrical engineer, Roumania House, Ivy Street, Colwyn Bay.—First and final dividend of 20s. in the £, payable June 28th, at Mostyn Chambers, Colwyn Bay.

P. M. ROGERS (LONGBRIDGE ENGINEERING CO.), electrical engineer, 40, Portland Street, Aberystwyth.—Trustee, Mr. H. W. Thomas, Official Receiver, 4, Queen Street, Carmarthen, released June 18th.

H. WEST, electrician, 3, Clyde Street, Canterbury.—Trustee, Mr. A. H. Ward, Official Receiver, 10, Bingate Street, Canterbury, released June 16th.

F. B. THORPE, electrical engineer, 1a, West Laithgate, Doncaster.—Last day for proofs for dividend, July 10th. Trustee, Mr. W. Emmerson, 99, Albion Street, Leeds.

H. ROGERS, electrical engineer and contractor, Friarsgate and Barbauld Street, Warrington.—Last day for proofs for dividend, July 10th. Trustee, Mr. C. T. Appleby, 29, Corporation Street, Birmingham.

**Company Liquidations.**—UNI-DIRECTIONAL APPARATUS CO., LTD., 14 and 16, Cockspur Street, S.W.—The statutory first meetings of the creditors and shareholders were held on June 25th at the Carey Street offices of the Board of Trade, Lincoln's Inn, W.C. A statement of affairs was presented showing liabilities £455, assets valued at £230, and a deficiency of £2,683 with regard to contributories, the issued capital being 20,000 ordinary shares of 1s. each and 1,458 preference shares of £1 each.

The Official Receiver reported that the company was registered as a private company on July 5th, 1923, with a nominal capital of £5,000, and was formed to carry on the business of electricians, and in particular to enter into an agreement with Mr. Aaron Barnett for the acquisition of patent No. 17,888 of 1922 for an electric lighting and dual ignition system for Ford cars. The patent was purchased by the company for £1,499 10s., payable as to £500 cash on completion, £500 out of the first net profits, and 9,990 ordinary shares of 1s. each. The cash (£500) was duly paid and the shares allotted. The company's business did not apparently get beyond the experimental stage with the patent. Mr. Barnett was appointed technical adviser to the company at a salary of £250 per annum, and the company's working capital had been exhausted at the end of 1923. He (Barnett) commenced the proceedings for arrears of salary, on which the company was ordered to be wound up. The liquidation was placed in the hands of Mr. W. E. Mindenhall, accountant, 14 and 16, Cockspur Street, S.W.

MACDONALD BROWN, LTD., electrical engineers, 15, Furnival Street, London, E.C.4.—In pursuance of the provisions of the Companies (Consolidation) Act, a meeting of the creditors of the above was held in June 19th at Worcester House, Walbrook, E.C., when the chair was occupied by Mr. H. C. Bound, C.A., the liquidator, who reported that the company passed resolutions for voluntary liquidation on May 31st. A statement of affairs was submitted showing the position as at that date. This statement disclosed liabilities of £1,670, of which £1,025 was due to unsecured creditors, while the Midland Bank, Ltd., was shown as creditor for £645 in respect of an overdraft. The total assets were £335, less £29 for preferential claims, leaving net assets of £306, or a deficiency as regarded the creditors of £1,364. The company was incorporated on April 1st, 1922. It possessed patents for changing picture signs, and it was stated that negotiations were proceeding with a certain firm for the sale of these patents. It was hoped to obtain between £400 and £500 for them, but no definite information could be given on that point. It was expected that the firm with whom the company was negotiating would make its decision with regard to the purchase of the patents within seven days.

The deficiency account showed that the loss on the trading since the date of incorporation was £535, while the expenses with regard to the signs amounted to £788. One small creditor had put in execution and had been paid out. In consequence of this and pressure by other creditors, and also having regard to the breakdown in negotiations for the sale of the patents, the company decided to go into voluntary liquidation. Resolutions were passed confirming the voluntary liquidation, with Mr. Bound as liquidator. The following are creditors:—

| | £ | | £ |
|---|---|---|---|
| Jacob Van den Berghs ... ... | 253 | Sun Electrical Co., Ltd. ... ... | 70 |
| Isaacs & Brown, Ltd. ... ... | 171 | Marryat & Scott ... ... ... | 50 |
| Jepson & Co. ... ... ... | 85 | Frank Kent & Co. ... ... | 43 |
| Dr. J. M. Brown ... ... ... | 70 | Matthews & Yates, Ltd. ... | 43 |

TILLING-STEVENS, LTD.—Meeting of members, July 24th, at the offices of Messrs. Thorne, Lancaster, Farey & Reacher, 46, Basinghall Street, E.C.2, to hear an account of the winding-up (under the voluntary liquidation) from the liquidator, Mr. M. Lancaster.

ACCUMULATOR INDUSTRIES, LTD.—Meeting of members, July 25th, at the offices of Messrs. J. & A. W. Sully & Co., 19 and 21, Queen Victoria Street, E.C.4, to hear an account of the winding-up from the liquidator, Mr. A. W. Sully.

GRASSINGTON ELECTRIC SUPPLY CO., LTD.—A first and final dividend of 3d. in the £ on the £1,500 capital of this company has been paid. The company was formed in 1907 to supply the Grassington district with electricity generated from water power from the River Wharfe, but the concern has not been a financial success and the plant has been purchased by the Linton Mills Estate Company for £550. Since the purchase the Estate Company has put down three additional turbines and accumulators, but it has also increased the charges from 25s. per year to £3 18s. for three lights, and from £15 to £75 for street lighting. The claims of the liquidator, the books, accounts and documents have been handed over to the purchasers, who have accepted responsibility.

W. T. RAWCLIFFE, LTD.—A petition for the winding up of this company has been presented to the County Court of Lancashire by Messrs. S. Bill & Co., Ltd., of 146, Queen's Road, Aston, Birmingham, and will be heard at the Court House, Salford, on July 18th.

STENTOPHONE MOTOR ACCESSORIES (1921), LTD.—Winding up voluntarily. Liquidator, Mr. A. Cripwell, 12, Cherry Street, Birmingham. A meeting of creditors was called for July 4th at the Chamber of Commerce, Birmingham. Particulars of claims to be sent to the liquidator by August 31st.

AUCKLAND ELECTRIC TRAMWAYS CO., LTD.—A meeting of members is called for July 30th at 88, Kingsway, W.C., to hear an account of the winding up from the liquidators, Messrs. C. G. Tegetmeier and P. M. Rossdale.

TAUNTON ELECTRIC TRACTION CO., LTD.—A meeting of members is called for July 31st, at 88, Kingsway, W.C., to hear an account of the winding up from the liquidators, Messrs. T. Bower and P. M. Rossdale.

**Private Arrangements.**—W. HALL & Co., electrical engineers and wireless dealers, 71, Beak Street, Regent Street, London, W.1.—A circular has been issued to the creditors herein by Mr. C. Latham, of Messrs. O. Sunderland & Co., accountants and auditors, 15, Eastcheap, E.C., declaring a second dividend of 2s. 6d. in the £ on the creditors' claims. The circular states that there being no improvement in the course of the business, the Committee found it necessary in March to authorise him, as trustee, to close it down and to realise the stock and effects by public auction. The prices realised for the stock by auction had no real relation to those given by Mr. Hall at the time of the creditors' meeting. There are one or two matters which prevent the estate being finally closed at present.

DANIEL GREGORY PAGE, trading as G. Page, 36, Cannon Street, Birmingham, electrical engineer.—The creditors interested herein were called together recently, when it was reported that the liabilities amounted to £1,649, while the assets, after deducting preferential claims of £43, totalled £446, or a deficiency of £1,203. Debtor is to be requested to execute a deed of assignment to Mr. W. Hand, of Messrs. Corfield & Cripwell, 12, Cherry Street, Birmingham, as trustee.

WILFRED HENRY HARRIS and PERCY HEBER OWEN, trading as Harris & Owen, 12, Highcross Street, Leicester, radio engineers and factors.—A meeting of the creditors was held on June 24th at the offices of Messrs. A. C. Palmer & Co., C.A., Friar Lane, Leicester, when a statement of affairs was presented which showed liabilities of £873, made up as follows:—Trade creditors £538, cash £323, and the bank £12. The net assets are £244, showing a deficiency of £629. The business was started in February, 1923, with a capital of £100, which was provided by the debtor Harris. Since the commencement of the business, Harris's drawings had been £40 10s. and those of Mr. Owen, who was the acting and full-time partner, £328 10s. After discussion, it was decided to confirm the deed of assignment already executed to Mr. T. Fleming Birch, C.A., of Leicester, as trustee, with a committee of inspection. The following are creditors:—

| | £ | | £ |
|---|---|---|---|
| Accumulators of Woking, Ltd.... | 19 | Reynolds, C. ... ... ... | 20 |
| Burndept, Ltd. ... ... ... | 288 | Philpott & Fisher ... ... ... | 20 |
| McMichael, L., Ltd. ... ... | 107 | | |

**Dissolutions of Partnership.**—EBONITE PARTS SUPPLIES, dealers in electrical and wireless parts, 51, Fann Street, E.C.—Messrs. E. P. Jeaffreson, A. B. Beech, and A. C. Syrett have dissolved partnership. All three parties will attend to debts, and the business will be continued by Mr. A. C. Syrett under the same style.

SPREADBOROUGH & RADFORD, electrical and mechanical engineers, 132, Burton Road, West Didsbury, Manchester.—Messrs. W. Spreadborough and J. Radford have dissolved partnership. Mr. Spreadborough will attend to debts.

MCREE WIRELESS, Corporation Street, and Navigation Street, Birmingham.—Messrs. N. H. A. Parsons and D. G. Prentice have dissolved partnership.

R. WOODRUFF & Co., electrical contractors and engineers, 550, Streatham High Road, S.W.16.—Mr. R. O. Woodruff and Mr. F. J. Lock have dissolved partnership. Mr. Lock will attend to debts.

LIVERPOOL ACCUMULATOR SERVICE CO., accumulator repairers, 181a, Duke Street, Liverpool.—Mr. R. F. W. Holding and Mr. H. Ashcroft have dissolved partnership. Debts will be attended to by Mr. Ashcroft, who will continue the business.

**Trade Announcements.**—MESSRS. FULLER'S UNITED ELECTRIC WORKS, LTD., of Chadwell Heath, Essex, have established new South Wales depôts, where stocks of their products are being carried, at the following addresses:—Pier Street, Swansea; 1, Wood Street, Cardiff; and at 24, Dock Street, Newport (Mon.).

MR. EDGAR R. MORRIS, A.M.I.E.E., electrical engineer, has opened new premises at Knifesmith Gate, Chesterfield.

Among the new companies registered in Scotland last week was the SCINTILLATING ADVERTISING CO. (SCOTLAND), LTD., 81, Dunlop Street, Glasgow. It is a private company with £5,000 capital, and it is to carry on the business of advertisers and exhibitors of electrical and other advertising signs.

The Glasgow office of the HOFFMANN MANUFACTURING CO., LTD., has been removed from Robertson Street to 192, West George Street, Glasgow, C2.

The business of MESSRS. SCHOLEY & CO., LTD., Victory Works, Gloucester Road, Croydon, including goodwill, plant and machinery, &c., has been bought by the CROYDON ENGINEERING CO., LTD., whose registration was recently announced in our "New Companies Registered" column. The new company proposes carrying on the manufacture of the standard lines of the former company.

MESSRS. HIGGS BROTHERS' new works at Witton are now completely equipped and the firm is moving from Sand Pits, Birmingham, to Witton during August Bank Holiday week. After that date the Sand Pits and Summer Hill Street works will be closed.

THE SCOTT INSULATED WIRE CO., LTD., has removed its offices to 69, Fleet Street, London, E.C.4, and all communications should be addressed there, though the works and stores remain at Campbell Road, N.4.

**Catalogues and Lists.**—ELECTRIC CONTROL, LTD., 117, Reid Street, Bridgeton, Glasgow.—A pamphlet illustrating the company's exhibits at Wembley, comprising control gear and h.p. transmission line equipment.

THE GEAR GRINDING CO., LTD., Handsworth, Birmingham.—A brochure describing the firm's system of gear hardening and grinding, with special reference to electric traction gearing.

SIEMENS & ENGLISH ELECTRIC LAMP CO., LTD., 38-39, Upper Thames Street, E.C.4.—Catalogue No. 70, containing illustrated details and prices of "Benjamin" reflector fittings, &c.

THE MIRRLEES WATSON CO., LTD., 7, Grosvenor Gardens, S.W.1.—A series of illustrated publications dealing with power plant accessories, including extraction pumps, ejectors, surface condensers, &c.

MESSRS. BRUCE PEEBLES & CO., LTD., Edinburgh.—Leaflet No. 145, dealing with "Peebles-Reyrolle" automatic sub-station plant.

THE BRITISH THOMSON-HOUSTON CO., LTD., Rugby.—Price List No. 5,122, "Field Rheostats"; Price List No. 2,520-B, "Generator and Motor Pulleys"; Descriptive List No. 4,110-B, "Air-break Knife Switches"; Descriptive List No. 3,310-A, "Truck Type Ironclad Switchgear for 3-phase Systems up to 11,000 V"; and Descriptive List No. 4,171-B, "Oil Immersed Circuit Breakers, Spring Operated, Motor Controlled."

MESSRS. FERGUSON, PAILIN & CO., LTD., Higher Openshaw, Manchester.—Catalogue Sections No. 30, S4, "Oil Immersed Circuit Breakers, Type Ma"; No. 35, S2, "Oil Immersed Circuit Breakers, Type Va"; and No. 150, S1, "Flameproof Interlocked Switch and Fuse Units."

MR. J. HAMILTON GIBSON, 3, Central Buildings, Westminster, S.W.1.—An illustrated pamphlet describing the "Unity" crankshaft.

ELECTRIC EQUIPMENT MANUFACTURERS PTY., LTD., Normanby Road, South Melbourne, Vic.—Leaflets Nos. 43 and 44, illustrating and describing a h.p. expulsion fuse.

METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester.—Leaflet No. 76/2-1, dealing with tubular resistance units and unit resistances.

BROOKHIRST SWITCHGEAR, LTD., Northgate Works, Chester.—Calendar cards for July, August and September, illustrating several of the company's productions.

Mr. J. FOTHERINGHAM, 234, St. Vincent Street, Glasgow.—A net trade price list of electrical accessories of all kinds.

THE CARPAX CO., LTD., 312, Deansgate, Manchester.—A pamphlet advertising connector clips for making temporary connections.

THE SILUMINITE INSULATOR CO., LTD., The Green, Southall, Middlesex.—A pamphlet, entitled "Safety First," containing particulars of "Siluminite," "Celestron," and other insulating media.

THE LONDON FACTORS AND AGENTS, LTD., 38 and 39, Parliament Street, S.W.1.—A price list of electrical supplies, including wiring materials, fittings, and appliances.

THE RADIO COMMUNICATION CO., LTD., 34-35, Norfolk Street, W.C.2.—A well-illustrated catalogue (price 6d.) of radio receiving apparatus and accessories. The publication contains numerous useful hints.

MESSRS. TRUSLOVE & CO., St. Peter's Engineering Works, Colchester.—An illustrated pamphlet describing the firm's "Wonder" rotary pump.

THE ZENITH WATCH MANUFACTURING CO., LTD., Le Locle, Switzerland.—Illustrated leaflets describing the "Zenith" electric clock.

**Electricity Supply in South America.**—The directors of the Compania Hispano-Americana de Electricidad, which will be remembered as the successor of the German Transmarine Electricity Company of Berlin, state that although the world crisis is far from reaching an end, the expansion of the Spanish-American countries is such that their activity does not cease to be intensified even in times of economic crises. The proof is to be found in the fact that it has been necessary to complete the measures taken in previous years with a view to meeting the constant increase in the consumption. The Société Financière de Transports et d'Entreprises Industrielles, of Brussels, has continued to assist in the establishment and execution of the scheme of extension, and as a result the maximum of efficiency of all technical improvements has been obtained. After referring to the growth of the supply business at Buenos Ayres and the new programme of extensions for this year and 1925, the report mentions the activity of the tramways at Montevideo and records net profits of 29,118,000 pesos for 1923, permitting of the payment of a dividend at the rate of 12 per cent.

**British Empire Exhibition Notes.**—An interesting series of industrial films is being exhibited in the Government Pavilion. These bring to the attention of the public the processes involved in the production of articles of everyday use, or which are seen without comprehension of their nature, in a vivid manner. Each film is of about 15 minutes' duration, and among the subjects with which they deal are electric lamp production, the manufacture of cotton, tin-plate, steel rod and wire, the production of iron ore, the electrical propulsion of ships, the building of a 40,000-kW turbo-generator, and many other matters. Their principal interest to electrical people lies in the fact that they were all produced by the British Thomson-Houston Co., Ltd., which for many years has used the kinematograph for educational and recording purposes.

The British Electrical Development Association has published two further pamphlets calling attention to its "Electricity in Service" exhibit at Wembley. These are written in a colloquial style without a touch of technicality and bring into prominence the labour-saving and enlightening attributes of electricity.

The attendance at the British Empire Exhibition since it opened on April 23rd, up to and including June 26th, has amounted to 5,522,155. On June 30th the number of visitors was 145,996, and during the previous 16 days there were only two occasions whereon the daily attendance did not reach 100,000, while on five days during the same period 150,000 people visited the show. Many large organised parties (both adults and school children) have been taken to Wembley; on Saturday, June 28th, twelve parties each numbered 1,000 or more, the largest being 3,000 from the Metropolitan-Vickers Works, Manchester.

Over 30,000 visitors to the Exhibition were brought into London on Saturday last by nearly 70 special trains run by the L.M.S. railway from provincial centres. There were 12 trains from Birmingham, 7 from Bradford, and 6 from Manchester. One of the largest parties was that of the Brush Electrical Engineering Company, of Loughborough, which filled three trains.

**Book Notices.**—"A Handbook of Telephone Circuit Diagrams with Explanations," by J. M. Heath. Pp. x+279; figs. 72. London: McGraw-Hill Publishing Co., Ltd. Price 12s. 6d. net.

Messrs. Crompton & Co., Ltd., Chelmsford, have lately published an interesting brochure containing a history of the firm, and numerous illustrations of its products over a period of 46 years. The position of "Crompton's" in the electrical industry renders the volume to a large extent a history of the industry. The pictures include views of many generators and motors which the company has produced from time to time, as well as illustrations of such things as a gearless locomotive (1896), "Crompton-Fox" cooking and heating apparatus (1892), the dynamos at the Law Courts (1882), and early instruments. The concluding section of the book contains representative illustrations of the firm's present-day productions.

Publications of the United States Bureau of Standards.—Circulars Nos. 156 and 161, "United States Government Specification for Coal-Tar Saturated Rag Felt for Roofing and Waterproofing" (5 cents each), and an index to Vol. 17 of the Bureau's Technologic Papers.

"Theoretische Telegraphie," by Dr. F. Breisig, pp. 548; figs. 240.—Brunswick: F. Vieweg Sohn Atk. Ges. Price 26 m.

"*Proceedings* of the Physical Society of London," Vol. xxxvi. Part 4. June 15th.—London: Fleetway Press, Ltd. Price 6s.

**Russian Industrial Notes.**—*The Electrical Bank.*—The shareholders in the Electro-Credit Company, at a meeting held in Moscow on June 19th, decided to transform the undertaking into a bank under the title of the "Bank for the Electrification of the Union of the Soviet Socialist Republics." The share capital has been fixed at 7,000,000 gold roubles and with the consent of the National Commissariat of Finance it is intended to issue an obligation loan. It was stated that no hopes existed of raising a loan abroad.

*Hydraulic Turbines.*—The Moscow Machine Trust has begun the organisation at one of its works of the production of hydraulic turbines of contemporary types. With this object the trust has secured the services of engineering specialists and entered into an agreement with the Hydraulic Laboratory of the Moscow High Technical College with regard to the utilisation of the equipment of the laboratory for testing the turbines, some of which are already in course of construction, for speeds up to 2,500 r.p.m., and lower speed turbines for small installations.

*Steam Turbines.*—Special attention is being devoted by the Leningrad Machine Trust to the construction of turbines both for steam and water power. The Trust's metal works recently turned out for the first time since the revolution a steam turbine of 3,000 h.p., for Omsk; turbines of up to 7,750 h.p. are in course of construction, and an order, as recently reported, has been received for a steam turbine of 15,000 h.p. from the Southern Steel Trust for the former Briansk ironworks. A

beginning is also being made with the construction of hydraulic turbines for the Tiflis hydro-electric works, this work representing the starting of a new branch of industry in Russia.

**The Electrification of Russia.**—At the instance of the State Planning Commission a general Russian congress on electricity supply was opened in Moscow on June 8th, and extended over several days. Prof. A. G. Kogan, who opened the proceedings, is reported to have stated that the general financial and economic situation of the country had not permitted it to enter upon the extensive steps contained in the original plan, and had forced the State to dwell upon only the principal points of the programme. Down to recent times most development had taken place in Moscow and Leningrad, while the electrification of the outer districts was, so far, proceeding but slowly. Recently the conditions of working had so far improved that if great difficulties did not arise the country would become possessed next year of a capacity of 200,000 kW in stations of regional importance. Besides stations of national significance, extensive initiative and the assistance of the State were necessary in the matter of the starting of stations of local importance, and small stations of the rural class. Work was being carried out in this direction, although slowly in view of the inadequacy of local funds. This address was followed by the presentation of reports on the activity of the Moscow Electricity Supply Trust, the General Electrical Commission, the Schatur station with its Makaroff furnaces, and the part played by fuel in the cost of producing energy and its sale price. Next came a report on the matter of railways, it being pointed out that in recent years the railways had been fully occupied with the process of restoration, but now the situation had changed, and it was possible to begin the work of electrifying the transport system. The construction of regional stations was being pushed forward, and it was submitted that the conversion of the railways must proceed in the closest contact with the electrification of the whole of the country. One of the chief problems under consideration at the moment was that of getting customers for the energy to be supplied by the regional stations, and for this purpose it would be necessary to erect a number of transmission lines and proceed with the equipment of works and mines for the use of electrical power. In this connection it was stated, in a report submitted to the board of the State Planning Commission on June 12th, that a sum of 12,500,000 roubles would be needed for next year, of which 10,000,000 roubles would be required from the State in the form of loans, and 2,500,000 roubles from the consumers. The board authorised the Energy Committee to work out the question of the measures which were requisite to secure a load on the regional stations when completed.

**Fuel Conservation.**—We have received from the National Fuel Conservation Co., Ltd., 25, Change Alley, Sheffield, a little pamphlet by Mr. C. F. Wade, A.M.I.Mech.E., A.M.I.E.E., setting forth the company's objects. A system of inspecting fuel combustion apparatus has been arranged by which the company will keep a constant watch upon installations after giving preliminary advice on the existing plant and suggesting improvements.

**Rose Day at Wembley.**—It might have been supposed that Rose Day would have been enthusiastically taken up at Wembley, but such was not the case. The reputation of the Exhibition was saved, however, for in the Palace of Engineering one firm—Venner Time Switches, Ltd.—made a show of their own by decorating their stand with Alexandra roses and giving it over for the day to the sale of these flowers, with the result that very few people entering the Faraday or Kelvin Gates emerged roseless.

**German Goods in Brazil.**—According to reports received in Washington from certain United States Consular Offices in Brazil, German competition in electrical goods is very active. German imports headed the list at Rio in March, being 90 tons in weight, compared with 80 from the United States, 20 from Italy, and a small quantity only from Great Britain. In Sao Paulo also the Germans have been selling a number of small electrical supplies very successfully, including bells and buzzers. They are also introducing dry batteries in competition with the American article, and offering cheap imitations of American designs of switches. The Consul reports that flashlight cases and batteries are now being manufactured in Rio. In suggesting by what method German competition may be overcome, it is pointed out that Germany is not as liberal in its terms of payment as before the war, and at the present time less so than British manufacturers. The usual term of payment is 90 days from date of invoice of delivery at Santos, or 120 days from date of invoice on small shipments. On larger shipments the following arrangement is made: one-third payment with order, one-third against documents, and one-third 90 days from date of delivery of documents. There are no special agencies in the market to which parcels can be consigned for release against delivery order attached to draft, but the banks or agents will take care of such shipments. The question frequently arises whether it is more advantageous to sell through a manufacturer's sales agent or directly to the wholesale importers without the mediation of a sales agent. To the American Consul it appears by far the better method to sell through direct factory representation in Sao Paulo and to have as a representative not one of the wholesale importing houses, but a special agent versed in the Portuguese language, to approach the various firms, to keep in touch with the needs of the market, and study the electrical supplies introduced by competitors.

**Danish Electrical Trade.**—The outstanding feature of the past year in Denmark has been the depreciation in the exchange value of Danish currency. Mr. R. M. A. Turner, the Commercial Secretary at Copenhagen, points out, in his recent report (D.O.T., price 2s.), that the principal cause is economic; State finances have shown a deficit and foreign trade figures an adverse balance. The authorities have been striving to bring about an improvement in both respects, but it is considered that their success depends upon the exercise of rigid economy by the individual. Mr. Turner thinks that probably the Danish people may, throughout the coming year, begin to practise that personal economy without which an improvement in the trade balance of the country would seem to be impossible. It may here be added that statistics which have been issued relative to the first quarter of 1924 show that the import surplus totalled 42 million kr. (about £1,680,000), against as much as 102 million (about £4,000,000) for the corresponding period of the previous year. The Government is credited with the intention of introducing a levy on an ascending scale on a capital of over 10,000 kr. (£400). There is now quite an extensive electrical manufacturing industry in Denmark, some 5,500 workpeople being engaged in the manufacture of dynamos, accumulators, cables, and porcelain fittings. The value of the total output last year was about 50 million kr. (£2,000,000). Early last year German competition showed signs of weakening, but since February it has strengthened again, particularly in small motors. Small accumulators also are imported in fair quantities from Germany, as well as the United States, and there appears to be a market for similar British accumulators for use for motor-cars and radio purposes. There is some export trade in dynamos up to 200 and 300 h.p. capacity, and a still more important business in small motors, fans, &c. The cable works have succeeded in increasing their output and, besides being competitive, enjoy the advantage of the preference which is now being given by public institutions and larger private companies to Danish work. Some increase in the export of the work has also been possible owing particularly to the low rate of the kroner.

**Engineering Employment in America.**—A statement issued by Mr. E. B. Miller, employment secretary of the American Association of Engineers, says that graduates in civil engineering are most in demand, as the schools close because of the unprecedented highway building programme throughout the country and other projects under way. "Electrical engineers are probably second in demand at this time," Mr. Miller says. "A great number of them go into the service of public utilities, usually big corporations. These have attained a stability that makes them less sensitive to the ups and downs of business than concerns that employ civil engineers. Their initial starting rate is usually low and advancement is slow, but employment is fairly permanent, and the big positions are the goal." Graduates in mechanical engineering will feel the business slump the most, the secretary thinks.—*Electrical World.*

**Forthcoming Exhibitions.**—The following exhibitions are being organised:—

LONDON.—September 5th to 27th, Machine Tool and Engineering Exhibition; November 3rd to 8th, International Cycle and Motor Show.

AUSTRALIA (*Melbourne*).—September, Electrical Exhibition.

BELGIUM (*Ghent*).—July 20th to September 15th, Exhibition of Electrical Appliances; (*Ostend*).—July 5th to 27th, Commercial Fair; (*Luxemburg*).—August 20th to 28th, Commercial Fair.

CANADA (*Toronto*).—August 25th to September 8th, Canadian National Exhibition.

CZECHO-SLOVAKIA (*Prague*).—September 21st to 28th, Autumn Samples Fair.

FRANCE (*Lyons*).—October 21st to November 20th, Autumn Fair.

HOLLAND (*Utrecht*).—September 9th to 18th, Netherlands Fair.

JUGO-SLAVIA (*Ljubliana*), August 15th to 25th, Samples Fair.

LATVIA (*Riga*).—July 20th to August 3rd, Agricultural and Industrial Fair.

NORWAY (*Christiania*).—August 31st to September 7th, Norwegian Industries Fair.

SWEDEN (*Gothenburg*).—August 4th to 10th, Swedish Industries Fair.

SWITZERLAND (*Lausanne*).—September 13th to 28th, Swiss Industries Fair.

**New French Company.**—La Société Electro-Bloc is the name of a new company which has lately been formed in Grenoble, with a capital of 500,000 francs, to manufacture electric motor vehicles.

**For Sale.**—Rotherham Corporation Electricity Department has about 270 d.c. meters for disposal, suitable for 230 V. By direction of the George Cohen & Armstrong Disposal Corporation, Messrs. Leopold Farmer & Son will sell by auction at the Gretna, on July 15th and following days, electrical equipment, builders' and contractors' material, stores, &c., lying at H.M. Factory, Gretna. Messrs. Horne & Co. will include in their sale by auction at Woolwich, on July 16th, a number of petrol-electric generating sets, several Rhodes motors, dynamos, and a 70-h.p. Diesel oil engine, &c.

(See our advertisement pages to-day.)

**Recent Contracts.**—Large orders for "Osram" lamps have been received by the GENERAL ELECTRIC CO., LTD., from the following sources:—The Victorian Railways; the New South Wales Government Railways; the War Office; and the London & North-Eastern Railway Co.

THE SIEMENS & ENGLISH ELECTRIC LAMP CO., LTD., has also received an order for lamps from the L. & N.E. Railway Co. (Southern Scottish Area).

The EDISON SWAN ELECTRIC CO., LTD., has received an order from the Admiralty for switches.

**Copper and Lead Prices.**—Messrs. F. Smith & Co. report July 1st:—Copper (electrolytic) bars, sheets and rods, no change; do. do. h.c. wire, 9¼d., 1-16d. increase.

Messrs. James & Shakespeare report July 2nd:—Copper bars (best selected), sheet and rod, no change; English pig lead, £34 5s., 15s. increase on last week's quotation.

## Lighting and Power Notes.

**Bethesda (North Wales).** — ELECTRICITY SUPPLY. — The Urban District Council is considering an electric lighting scheme for the district and has decided to call a ratepayers' meeting to further discuss the proposal which, it is expected, will involve an expenditure of £8,000.

**Blackburn.**—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer and manager, P. P. Wheelwright) for the year ended March 31st last, record a total revenue of £158,301, as compared with £145,893 in 1922-23. Working expenses amounted to £76,272 (£77,684), leaving a gross profit of £82,029. After deducting capital charges there was a net surplus of £9,350, as compared with a profit of £17,224 in the previous year. During the year £192,597 was spent on capital account, the chief items being £96,375 for machinery and plant and £53,911 for mains and services. The electrical energy sold increased from 16,308,717 to 17,237,626 kWh.

**Bolton.**—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (borough electrical engineer, Mr. W. J. H. Wood) for the year ended March 31st last, show a total income of £273,598, as compared with £271,943 in 1922-23. Working expenses totalled £131,013, as against £130,449, leaving a gross surplus of £142,585 (£141,494). After deducting capital charges there was a net profit of £17,434, to which was added £20,404 brought forward from the previous year, making a total of £37,838. Of this amount £12,765 was contributed to capital, leaving a balance of £25,073 to be carried forward. The capital expenditure during the year amounted to £91,192, the main items being extensions to Back-o'-th'-Bank works, £50,348, and mains, £18,826. The electrical energy sold increased during the year from 38,279,725 to 43,584,616 kWh.

**Bury.**—LOAN SANCTIONED.—The Electricity Committee has received the sanction of the Electricity Commissioners to the borrowing of £36,647 for circulating pipes, buildings, works and plant, and £5,000 for the installation of a converter and switchgear at Chamber Hall.

**Continental.**—RUSSIA.—According to the *Commercial and Industrial Gazette* the board of the Azneft has begun preliminary work in connection with the scheme for the electrification of all the Azneft enterprises. It is intended to carry out the scheme in three stages between 1924 and 1927.—*Reuter's Trade Service* (Moscow).

FRANCE.—New turbo-generator sets have recently been installed at the electric power stations at Lomme and Jeumont of the Société d'Electricité et Gas du Nord. A new station is also approaching completion at Aulnoye.

La Société Triphase, of Paris, is increasing its capital from 20 to 40 million francs with the object of acquiring the electricity supply undertaking of the Société d'Eclairage et de Force par l'Electricité, in the north district of Paris. The last named company reports a net profit of 1,347,085 fr. for the last financial year as compared with 918,842 fr. in 1922.

**Coventry.**—YEAR'S WORKING.—The report on the working of the City electricity undertaking (engineer and manager, Mr. G. Tough) for the year ended March 31st last, shows that the revenue was £221,417, an increase of £16,161 on that of the previous year. Working expenses amounted to £116,415, as compared with £99,278, leaving a gross surplus of £105,002 (£105,978). Capital charges absorbed £57,202, and there was a net profit of £47,801, as against £46,089 in 1922-23. During the year £54,567 was spent on capital account, of which £36,749 was expended in respect of part cost of an additional 6,000 kW turbo-alternator, together with necessary buildings, &c., and £17,818 for extensions to mains, distributing stations and services, making the total expended on the undertaking £833,061. The number of consumers increased from 10,239 to 11,283, and the amount of electrical energy sold was 43,342,173 kWh, an increase of 8,515,697 kWh.

**East Preston (Sussex).**—ELECTRICITY SUPPLY.—The Rural District Council has decided to oppose the application of the Sussex Electricity Co. for an Order to supply electricity to the parishes of Rustington, Angmering and East Preston, unless cables are laid underground, and the company undertakes to supply the parishes named within a period of two years.

**Lancaster.**—INAUGURATION OF NEW POWER STATION.—The new power station at Caton Road was formally inaugurated by Sir John Snell on June 26th. The main plant consists of three turbo-alternators each of 1,000-kW capacity, which will probably be increased to 5,000 kW. The station was originally the power-house of the National Projectile Factory, but the plant installed by the Government was unsuitable for public supply, and was replaced by modern plant. A bulk supply will be given to Morecambe Corporation, and three sub-stations are to be constructed in Lancaster to provide a l.p., a.c., supply. A supply will also be given to Heysham, Carnforth, and Bentham. The electrical engineer is Major G. C. Milnes, M.C.

**Littlehampton.**—OPPOSITION TO ORDER.—The Urban District Council, on June 18th, decided to oppose the application of the Sussex Electricity Supply Co. for an Order to extend its area of supply so as to include Rustington, Angmering, and adjacent villages. An agreement between the Council and the company provides that Littlehampton and Wick should be supplied with electricity, and that at the end of ten years the Council should have the option of purchasing the undertaking. A new clause in the Order applied for provides that the Littlehampton Council shall obtain the consent of the East Preston Rural District Council before it can purchase the undertaking, and to this the Littlehampton Council will not agree.

**London.**—HACKNEY.—The Borough Council is applying to the Electricity Commissioners for sanction to the borrowing of £2,350 for laying additional conduits in connection with the proposed linking up with Islington.

STEPNEY.—The London, Midland, and Scottish Railway is inviting tenders for a bulk supply of electricity for the purposes of operating the train service between Mile End and Barking, and the Electricity Committee has recommended that the borough electrical engineer be authorised to tender for the supply.

**Maldon (Essex).**—SPECIAL ORDER.—Application has been made to the Electricity Commissioners by Messrs. John Sadd and Sons, Ltd., for a Special Order authorising the company to supply electricity in the borough and certain parishes in the rural district of Maldon.

**Portsmouth.**—SPECIAL ORDER.—The Town Council has applied to the Electricity Commissioners for a Special Order authorising it to extend its area of supply so as to include the rural districts of Catherington and Fareham, and part of the rural district of Westbourne.

**Preesall.**—SPECIAL ORDER.—The Urban District Council is applying to the Electricity Commissioners for a Special Order authorising it to give a supply of electricity throughout the district.

**Price Reductions.**—Reductions in the charges for electricity have been made or recommended in the following districts:—

RUGBY.—Lighting: First 500 kWh, from 5½d. to 4½d. per kWh. Next 500 kWh, from 5d. to 4½d. per kWh. Next 500 kWh, from 4½d. to 4d. per kWh. For all energy in excess of this amount, from 4d. to 3½d. per kWh.

LEEDS.—It is proposed to abolish the additions of 20 per cent. upon the charges for electricity for power, and 50 per cent. upon the charges for energy for other purposes, and to institute a new scale partly offsetting the effect of this. This new scale raises the consumption limits above which reduced prices are charged, increases the "rateable value" initial charge, &c. The estimated cost of the reduction thus made is about £58,000 per annum. The power charges will be reduced, generally speaking, to the pre-war level. The consumption of energy for industrial heating is encouraged by means of a new sliding scale. At the same time, it is recommended that the rental of electric cookers be reduced to 10s. per quarter, and that electric wash boilers be put on hire at a charge of 5s. per quarter.

MANCHESTER.—Lighting, flat rate: From 6d. to 5½d. per kWh. Sliding scale: From £14 to £10 per kW, the "unit" charge to remain unchanged. The reductions do not affect household consumers.

KINGSTON-ON-THAMES.—General lighting: Varying from 6d. to 3½d. per kWh, according to quantity consumed. Basement lighting: Varying from 4d. to 3d. per kWh. Prepayment meters: 7d. per kWh.

FLEETWOOD.—Lighting, cooking and heating: A reduction of ½d. per kWh. Power: A reduction of ½d. per kWh.

**Seaton (Devon).**—INAUGURATION OF SUPPLY.—On June 23rd Mr. C. C. Gould, chairman of the Urban District Council, formally switched on the current at the new power station of the Seaton & District Electric Light Co., Ltd.

**Southport.**—NEW SUB-STATION.—The Electricity Committee is to erect a new sub-station in Manor Road, Churchtown, with a view to extending the supply of electricity to that area.

**Southwick.**—SPECIAL ORDER.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation a Special Order giving the Urban District Council power to supply electricity within the urban district.

**St. Helens.**—YEAR'S WORKING.—The report of the borough electrical engineer, Mr. F. N. Rendell Baker, on the working of the electricity undertaking for the year ended March 31st last shows that the gross profit was £39,309, and, after providing for interest and sinking fund charges, there was a surplus of £18,672. The electrical energy sold totalled 26,911,830 kWh, as against 19,135,833 kWh, and the number of new consumers connected during the year was 329. In the last three years the total number of consumers has increased by over 100 per cent. The total works cost was .48d. per kWh sold, compared with .56d. in the previous year, and the average price obtained was .84d. per kWh.

**Swansea.**—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (borough electrical engineer, Mr. J. W. Burr) for the year ended March 31st last record a total revenue of £151,086, as compared with £119,770 in 1922-23. Working expenses amounted to £85,237, as against £64,559, leaving a gross profit of £65,849 (£55,211). After deducting capital charges, there was a net surplus of £24,094, as compared with a profit of £18,564 in the previous year. The capital expenditure during the year amounted to £89,925, making the total expended on the undertaking £611,397, and the electrical energy sold showed an increase of 58 per cent. A 10,000-kW turbo-generator has been placed on order, which, when installed, will bring the capacity of the power station up to 23,000 kW. One 36,000-lb. boiler was installed during the year, and two additional boilers have been placed on order. Orders for mechanical coal and ash handling plant have also been placed. Three collieries, as well as the Gorseinon Electric Lighting Co., Ltd., are now taking a supply from the 33,000-V transmission system; two other collieries are waiting to be connected, and a further colliery is negotiating for a supply.

**Tiverton.**—ELECTRICITY CHARGES.—In connection with the electricity scheme, the Town Council has approved the following scale of charges:—Lighting: First 300 kWh, 9d.; next 200, 8½d.; all energy beyond this, 8d. Power: First 400 kWh, 4½d.; next 500, 4d.; all energy beyond this, 3d. per unit. Meter rents: Minimum, 1s. 6d. per quarter.

**United States.**—ELECTRICAL DEVELOPMENT.—The *Electrical World* states that the expenditure for new construction by the "electric utilities" of California for the year 1924 will exceed 50 million dollars, according to figures compiled by the Railroad Commission. One of the principal schemes now in hand in the State is the Pit River No. 3 hydro-electric development of the Pacific Gas & Electric Co. This will be completed during the summer of 1925, and will provide an additional 100,000 h.p. The Southern California Edison Co. will expend over $10,000,000 on its Big Creek hydro-electric development this year alone. The Florence Lake tunnel will be completed at a cost of about $6,000,000, and over $2,000,000 will be spent for an additional 25,000-kW generator in each of power houses Nos. 1 and 2 on the Big Creek development. In addition to these schemes the Southern California Edison Co. will have three steam turbo-generators totalling 20,000 kW in operation by July 1st, 1924, and the Pacific Gas & Electric Co. is installing a 15,000-kW turbine at Sacramento which, it is announced, will be ready for operation in August.

**Walton-on-Naze.**—NEW PLANT.—The Electricity Committee proposes to install additional plant at the electricity works, and application is to be made to the Electricity Commissioners for sanction to the borrowing of £3,000 for this purpose.

## Tramway and Railway Notes.

**Bradford.**—TRACK RENEWALS.—The Corporation has decided to renew the tramway track on further routes. As soon as the track at Bradford Moor has been completed, work on the permanent-way in Nelson Street and parts of Wakefield Road will be commenced. The Otley Road route has been relaid, and was recently inaugurated.

**Continental.**—SWITZERLAND.—Trial runs with electric locomotives were satisfactorily carried out on May 14th between Lausanne and St. Maurice (46 kilometres). Electric traction was taken up on that section on May 21st, so that the 146 kilometres between Lausanne and Brigue is now entirely operated by electricity—Lausanne-St. Maurice-Sion (93 kilometres) by single-phase current, and Sion-Brigue (53 kilometres) by three-phase current. On May 17th the first electric locomotive was run on the Olten-Basle section (40 kilometres). The opening of this section on May 20th, following that of the Lucerne-Olten division (56 kilometres) on February 21st last, completed the electrification of the whole Gotthard system from Basle to Chiasso (331 kilometres), at a cost of nearly 375 million fr. The electrification of the Gotthard line, which is the most important in Switzerland, has made possible a reduction of 70 to 90 minutes in the time taken by the fastest trains run with steam locomotives. Electrification work on the Zurich-Aarau-Olten section (63 kilometres) is well advanced, and is expected to be completed by the end of the year. It is proposed, however, to electrify the Olten-Aarau section (13 kilometres) by August next. The Lausanne-Daillens-Vallorbe (47 kilometres) and Daillens-Yverdon (19 kilometres) will be ready for electric traction in September, 1924. Electric traction was introduced on June 1st on the Sihl Valley Railway (18 kilometres) running between Zurich and Sihlbrugg. The Federal Railways are now working 601 kilometres of electrified lines.

A new electric railway, known as the Centovalli line, has recently been completed between Locarno, at the head of Lake Maggiore, and Domodossola. It is of importance as providing a connecting link on the south side of the Alps between the St. Gothard and Simplon railways, and affording a quicker means of connection between Italian and French Switzerland. The new line is 32 miles long.

**Bury.**—TRAMWAY EXTENSIONS.—The Tramways Committee has decided to apply to the Ministry of Transport for sanction to proceed with the construction of an additional siding and crossing on the Haymarket side of the Kay Street Gardens, to be used for football traffic.

**Halifax.**—YEAR'S WORKING.—The working of the tramways of the Corporation for the year ended March 31st last resulted in a profit of £11,100, as compared with £18,254 in the previous year. The revenue was £222,022, and expenditure £210,922. The number of passengers carried was 23,789,656, and the number of car-miles run 2,358,080.

**London.**—L.C.C. TRAMWAYS.—The Highways Committee of the London County Council reports that the total revenue receipts for the year ended March 31st last were £4,374,057, as compared with £4,895,605 in 1923-24. The gross surplus was £545,454, as against £873,968, and after defraying capital charges, &c., the result was a net deficit of £160,222. In the previous year there was a net profit of £232,327.

## Telegraph and Telephone Notes.

**Irish Free State.**—TELEPHONE BILL.—The Telephone Capital Bill was read a second time in Dail Eireann last week. The Minister of Finance explained that the Bill authorised him to borrow money which will enable the Minister for Posts and Telegraphs—that is, the Free State Postmaster-General—to extend the telephone service in the Free State. His estimate of the sum which will be required for this purpose during the next two years is £500,000. Mr. J. J. Walsh, P.M.G., gave some particulars of the contemplated development. The present Administration, he said, had expedited the installation of instruments in Dublin. The Provincial centres, however, were ill-equipped, and the Government proposed to extend the cables already laid from Dublin to Cork and Mullingar, to Athlone, Longford, Roscommon, and other towns. Afterwards the smaller towns and villages would be connected. The Government had been hindered by destruction and by the dearth of skilled workers, but since the Treaty as many wires had been installed in Dublin as during the whole previous history of the service, and there were now nearing completion ten thousand pairs of new lines.

**Spain.**—REDUCTION OF TELEGRAPH RATES.—*Reuter's* Agency is informed by the Eastern and Direct Spanish Telegraph Companies that the rate for telegrams from Great Britain to Spain and the Canary Islands was to be reduced to 2½d. and 4½d. per word, respectively, from July 1st.

**The Telephone Service.**—WEATHER REPORTS.—The Postmaster-General, Mr. V. Hartshorn, states that the system of communicating weather reports to telephone subscribers, which was started in April, 1923, has been abandoned because the use made of it was trifling.

RE-NUMBERING.—Owing to the forthcoming introduction of automatic telephone exchanges in London, the call numbers of certain subscribers having more than four figures are to be altered so that they will all be composed of four digits only. This change will be made on October 1st, and the name of the Hammersmith exchange is to be changed to Riverside, as under the system of automatic switching the first three letters of Hammersmith send the same numerical signs as those of Hampstead. For a similar reason Bromley will be re-named Ravensbourne, Dalston will become Clissold, and Hornsey will be known as Mount Vernon, &c.

NEW EXCHANGES.—Two new exchanges are to be built shortly, to be called Strand and Sloane, the latter being on a site already bought in Sloane Square, S.W.

A new exchange was put into service at Liverpool on June 28th to replace the Old Swan exchange. It will serve the same area as the old one, and render a much improved service.

The 15,000 inhabitants of Pudsey, Yorkshire, have no telephone exchange bearing the name of the town. The names of subscribers in the district are scattered in the Leeds and Bradford sections of the telephone directory as bearing Stanningley exchange numbers, which name covers a multitude of small villages in the neighbourhood. The Post Office has at last built a new exchange within the Pudsey borough, but it is still to be called Stanningley!—*Daily Mail.*

REDUCED CHARGES.—The reduction in certain ordinary and trunk telephone charges, which were made in the last Budget, came into force on July 1st. It is reported that the change will cost the Post Office nearly £2,000,000 in a full year, or £1,000,000 in the current year. An increase of business is, however, anticipated as a consequence of the lower rate. There are now in use 1,158,492 telephones, compared with 1,050,672 at the end of March, 1923—an increase of 107,820, the net increase for the two previous years having been 51,060 and 8,361. The number of installations in dwelling houses rose from 154,068 in 1923 to 186,684 in 1924.—*Daily News.*

# Radio Notes.

**United States.**—FARMERS AND WIRELESS.—The importance of radio-telephony in the production and sale of agricultural products is brought out in a special survey of about 1,200 representative farmers lately completed by the United States Department of Agriculture. More than 50 per cent. of the 1,200 farmers replying reported that they owned valve sets employing three or more valves, while approximately 50 per cent. have home-made sets ranging from simple crystal detectors to valve instruments.

ACCUMULATORS FOR BROADCASTING STATIONS.—The use of storage batteries for supplying power to broadcasting stations in the United States is increasing. By their use the noise commonly known as generator hum is claimed to be eliminated and the tuning is made sharper. In the case of the Cincinnati broadcasting station, which has lately been equipped with storage batteries, 800 cells will furnish 1,600 volts to the transmitter, and it is expected that their use will increase the carrying power of the station several thousand miles.

**Wave-Lengths.** — INTERNATIONAL COMMITTEE. — An international committee has been set up to consider the subject of wave-lengths for broadcasting, as in many districts transmitting on a wave of from 300 to 500 metres is rapidly becoming impossible owing to the interference by stations using the Morse code.—*Daily Mail.*

# Contracts Open and Closed.

*(The date given in parentheses at the end of the paragraph indicates the issue of the* ELECTRICAL REVIEW *in which the "Official Notice" appeared in our advertisement pages.)*

## Open.

**Australia.**—PERTH.—August 15th. Government of Western Australia. One 12,500-kW turbo-alternator, with condensing plant. Water-tube boilers, economiser, fans, chimney, &c. Also coal and ash plant. (June 20th.)

**Belgium.**—July 17th. Municipal authorities of Schaerbeek. (1) 15 tons of insulating material; (2) 800 electricity meter mounting boards; (3) 10,000 metres of 600-megohm insulated copper wire and 1,500 metres of Bergman tubing; (4) 625 consumers' connection boxes and 1,500 derivation boxes. Particulars from Bureau du Service de l'Electricité, Hôtel Communal, Schaerbeek.

**Bingley.**—July 11th. Electricity Department. E.h.p. switchboard and l.p. switchboard. (June 20th.)

**Bradford.**—July 12th. Town Council. Electric lighting installation for 202 houses, various sites, for Town Council. Particulars from city architect, Town Hall, Bradford.

**Canada.**—August 5th. City of Toronto, Department of Works. Supply and installation of three centrifugal sewage pumps, direct-connected to electric motors.*

**China.**—HANKOW.—September 30th. Hankow Water Works and Electric Light Co. Nine 1,000-kVA transformers for 2,300/6,000 volts; six 210-kVA transformers for 2,300/460 volts.

**Hull.**—July 14th. Tramways Sub-Committee. 1,000 or 1,500 tons tramway rails, with fishplates and sole plates. Mr. F. W. Bricknell, city engineer, Guildhall, Hull.

**India.**—DELHI.—August 24th. Controller of Stores. Manufacture, delivery, and erection of passenger and goods lifts in Government buildings. (See this issue.)

**Leyton.**—July 18th. Urban District Council. Electrical wiring ("Henley" system) at six schools. (June 27th.)

**London.**—H.M. OFFICE OF WORKS.—July 15th. Electric wiring in steel conduit at Somerset House. (June 27th.)

HANWELL.—July 26th. Electric lighting installation at the Central London District School (June 27th.)

ST. PANCRAS.—July 15th. Electricity Committee. Two water-tube boilers, 40,000 lb. each, complete with pulverised fuel plant. (See this issue.)

METROPOLITAN ASYLUMS BOARD.—July 16th. Installation of electric lighting and power mains, &c., at the offices of the Board, installation of internal telephone system at the Accountant's Department, and installation of an internal telephone system in the Engineer-in-Chief's Department. (See this issue.)

LAMBETH, S.E.—India Store Department. July 28th. Porcelain insulator cups. (See this issue.)

LONDON COUNTY COUNCIL. August 11th. One electrically-driven tower wagon complete. (See this issue.)

**Lowestoft.**—July 14th. Mutford and Lothingland Board of Guardians. Installation of electric lighting at the Workhouse and Infirmary. (June 27th.)

**New Zealand.**—DUNEDIN.—August 15th. City Corporation. One synchronous condenser.

WELLINGTON.—August 26th. Department of Public Works. One 30-ton electrically-operated overhead travelling crane for Lyttelton.*

**Rumania.**—TIMISOARA, TRANSYLVANIA.—July 31st. Town Electricity Works. Central switchboard.*

**Saffron Walden.**—July 21st. Town Council. Electricity supply plant and overhead mains. (See this issue.)

**South Africa.**—CAPE TOWN.—July 7th. Municipal Council. 1,000 a.c. meters, house service type.*

July 22nd. H.p. ironclad switchgear.*

Various workshop appliances, including portable electric drills, arc welding plant, &c.*

JOHANNESBURG.—July 31st. Municipal Council. Single-phase transformers and spares.*

**Sweden.**—STOCKHOLM.—July 8th. Royal Medical Board (Kungliga Medicinalstyrelsen). Eighteen electric lifts for the Helsingborg Lunatic Asylum.

**Uruguay.**—MONTEVIDEO.—August 20th. State Electricity Works. 45,000 metres of lead-covered cable.*

August 21st. Special cables.*

August 26th. Rubber-insulated cords.*

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

## Closed.

**Colchester.**—Board of Guardians. Accepted:—

Installing electric light.—Messrs. Truslove.

**Dundee.**—Offers for the supply of small quantities of cable were considered by the Corporation Electricity Committee. In five cases foreign offers were the cheapest, but it was decided to give all the contracts to British manufacturers.

**France.**—In view of the many projects for the installation of underground telephone trunk lines on the Continent, a number of Belgian and French manufacturers of cables and telephonic apparatus have recently participated in the formation of a new company with the title La Société des Lignes Télégraphiques et Téléphoniques, to cater specially for this class of work. Amongst contracts recently secured by the new undertaking is one for the supply and laying of a telephone cable to connect Paris with Nancy and Strassburg, with eventually a branch to Basle.

**Glasgow.**—Electricity Committee. Recommended:—

Four 200-kW transformers for sub-stations (£255 each transformer).—Foster Engineering Co.

**Hull.**—Electricity Committee. Accepted:—

Erection of a new sub-station at St. Andrew's Dock (£760).—John Houlton and Son.

**Japan.**—According to *Reuter's Trade Service* (New York), the Westinghouse Electric International has received a contract for railway electrification equipment to the value of 1,500,000 dollars from Messrs. Takata & Co., acting as agents for the Imperial Government Railways of Japan. The equipment, which includes eight large locomotives for high-speed express service, will be used in connection with the extension of the electrical service in the vicinity of Tokio.

**Lancaster.—**

L.p. switchgear for sub-stations (£228 per station).—Messrs. Reyrolle, Ltd.

**London.**—LONDON COUNTY COUNCIL.—Education Committee. Accepted:—

Installation of electric lighting:—London Fields school, Hackney (£619).—H. J. Cash & Co., Ltd.

Elfrida School, Lewisham (£418).—W. Sugg & Co., Ltd.

FULHAM.—Electricity and Lighting Committee. Recommended:—

Mechanical stokers (£1,410).—Erith Engineering Co.

METROPOLITAN ASYLUMS BOARD.—Works Committee.

Installation of an automatic telephone system at Darenth Training Colony:—

| | |
|---|---|
| **V. G. Middleton & Co., Ltd.** (Accepted.) ... ... ... | **£1,405** |
| T. Clarke & Co., Ltd. ... ... ... ... ... ... ... ... | 1,424 |
| Toy & Winslow ... ... ... ... ... ... ... ... ... | 1,630 |
| Reliance Telephone Co., Ltd. ... ... ... ... ... ... ... | 2,372 |

**Oswaldtwistle.—**

Installation of electric light in St. Paul's School.—Mr. F. Greenhalgh.

**Swansea.**—Electricity Committee. Accepted:—

Switchgear for the new 10,000-kW set.—Metropolitan-Vickers Electrical Co., Ltd. The amount of the tender was £822, or £372 less than the highest quotation sent in.

**Wigton.**—Board of Guardians. Accepted:—

Installing electric light at Highfield House (£676).—Bell & Co.

# Forthcoming Events.

**World Power Conference.**—At the British Empire Exhibition. June 30th to July 12th.

**Institution of Civil Engineers.**—At the Institution, Great George Street, Westminster, S.W. Tuesday, July 8th. At 8.30 p.m. James Forrest Lecture on "Electrical Progress and Its Unsolved Problems," by Prof. Elihu Thomson.

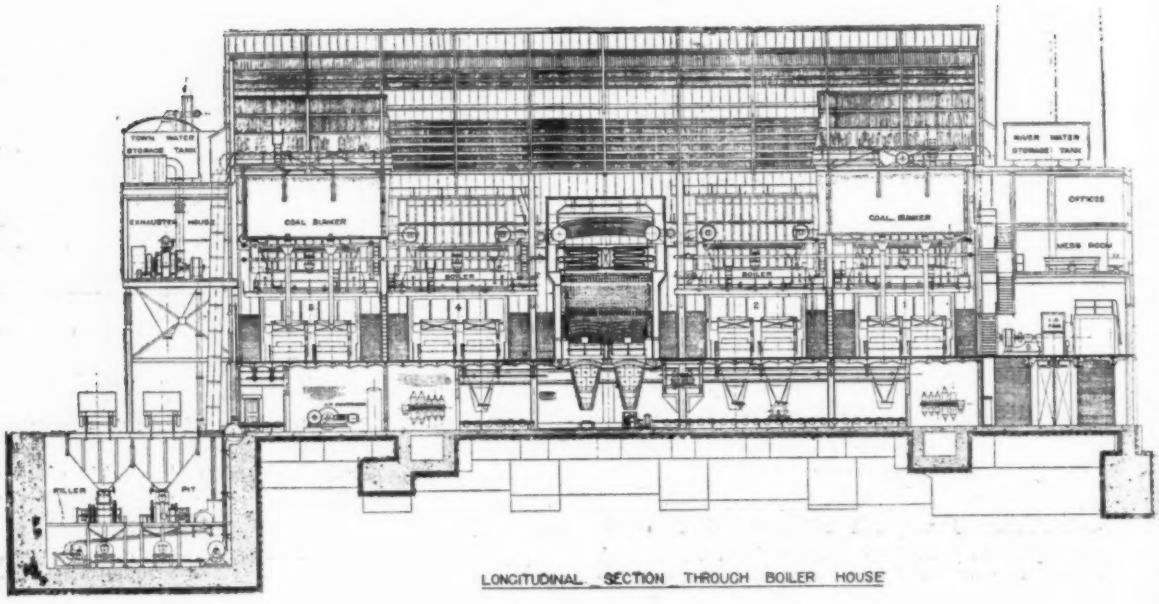
Wednesday, July 9th. From 8 to 11.30 p.m. Conversazione.

**Institution of Electrical Engineers.**—Thursday, July 10th. At 4.30 p.m. Presentation of the Kelvin Medal, 1923, to Prof. Elihu Thomson. Memorial Oration by Sir J. J. Thomson.

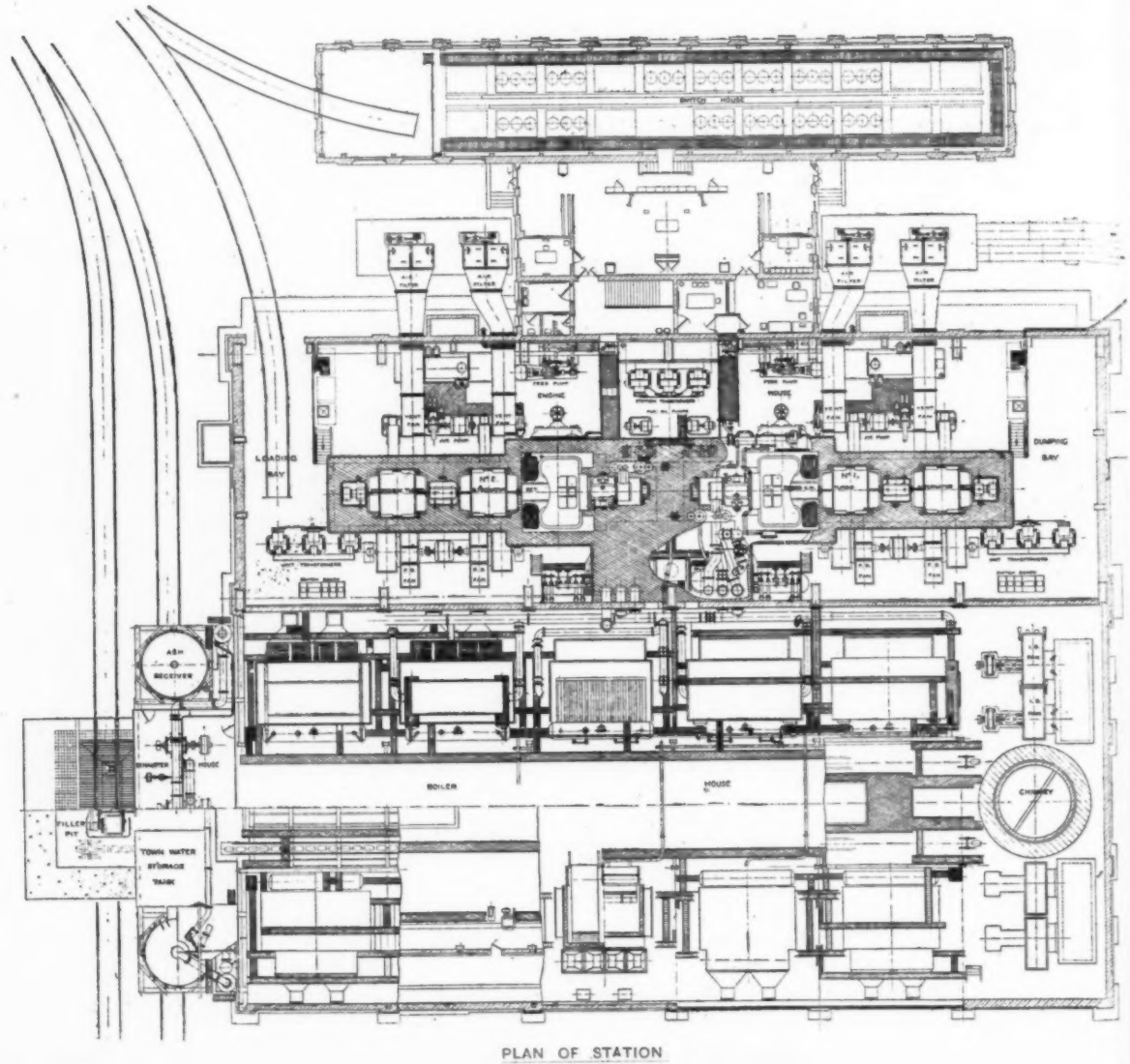
Friday, July 11th. At the Connaught Rooms, London. At 6.45 for 7.15 p.m. Kelvin Centenary Banquet.

Saturday, July 12th Visit to Cambridge.

## North Tees Generating Station.




LONGITUDINAL SECTION THROUGH BOILER HOUSE




PLAN OF STATION

Fig. 1.—Longitudinal Section and Plan of the North Tees Station (see p. 19).

# The North Tees Power Station.

## An Interesting New British Plant.

THE areas of the associated power companies now controlled by the Newcastle-upon-Tyne Electric Supply Co., Ltd., covering some 1,400 sq. miles in Northumberland, Durham, and the Cleveland district of Yorkshire, have been for many years past developed on a uniform system, the undertakings of the respective companies being operated in close association as a single power supply network. Since 1917 the association has been still closer as the Newcastle-upon-Tyne Electric Supply Co. then undertook the operation and management of the whole of the associated companies' undertakings. Previously, practically the whole of the coal-fired generating plant of the group was concentrated on the Tyne in the Carville and Dunston generating stations. A considerable proportion of the output was provided by waste-heat plant at various collieries in the Durham coalfield and at various iron and steel works on the Tees. In the Tees area the waste-heat supply was supplemented by a small coal-fired station at Grangetown, while the increased demand for electricity in the Tees area, due to war industries, was largely met by energy transmitted from the two main stations on the Tyne.

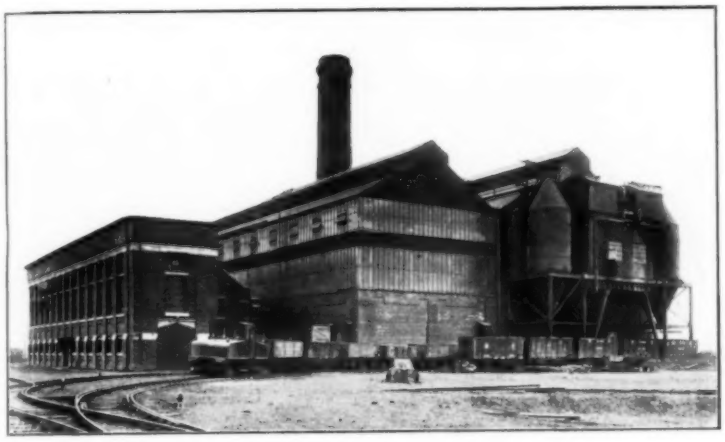


Fig. 2.—North Tees Generating Station.

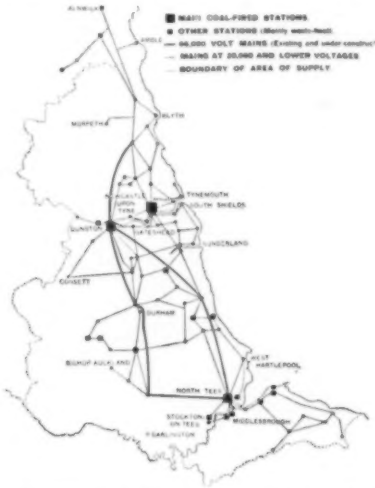



Fig. 3.—North-Eastern Power Companies' Area of Supply.

Looking at the system as a whole, therefore, it appeared that the most economical place at which to install new plant was in the Tees area, where, except for a somewhat longer coal haulage, conditions were as favourable for generation as on the Tyne. Having in view the rapid development of the Carville and Dunston stations, it was obvious that provision should be made for an eventual very large development on the Tees. Accordingly a site of 56 acres was obtained on the north bank of the River Tees having 2,000 ft. of river frontage, which will permit eventual development to some 500,000 kW.

It will be possible to run the newer plant at a very high plant load factor, thus justifying the design of the station on the basis of maximum efficiency in terms of coal per kWh sent out, and in view of the departures from normal design that were introduced into the new plant it was decided to build a complete self-contained two-unit station so arranged that it could eventually either be treated as an annex to a larger station operating under the same cycle conditions, or if (as a result of experience) modifications in the cycle conditions were found desirable, it could be kept entirely separate from any extension plant. The station construction work commenced in 1917, at which time the highest steam pressure and temperature used in any large generating station were those at Carville "B," *i.e.*, 275 lb. per sq. in. and 700 deg. F. For the new station what was then the very high pressure of 450 lb. per sq. in. at the turbine stop valve (or 475 lb. per sq. in. at the boilers) was adopted, but the normal total temperature of the superheated steam was kept at 700 deg. F., as that appeared to be about the limit for the ordinary materials available.

Prominent among other cycle changes discussed was the proposal, due to Dr. S. Z. de Ferranti, that considerable gain would result from reheating the steam during expansion; therefore, reheating at one point only was adopted at North Tees, the decision being largely influenced by the higher steam pressure used, which makes the benefit of reheating greater.

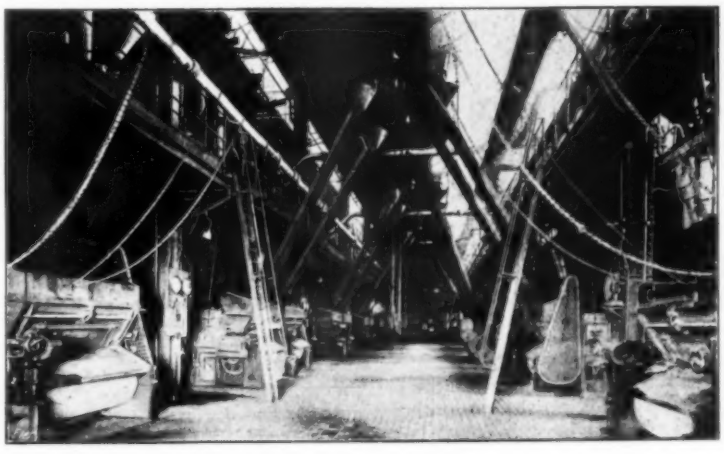


Fig. 4. Boiler House.

Another suggestion was to bleed steam during the process of expansion for the purpose of heating the feed water, useful application being made of the heat in the flue gases (which for many years past had been com-

monly used for feed water heating) for heating the incoming air to the furnaces. Accordingly, three heaters in series fed by steam at high, intermediate, and low pressure, supplemented by two heaters taking steam from the glands and from the drains, were used.

Fig. 3 shows the area of supply of the North-Eastern Power Companies, their main network, and the position of North Tees relatively to their other generating stations. Fig. 1, p. 18, shows respectively a longitudinal section, and a plan of the complete station. Choosing the highest practical speed permitted by the system frequency—on the North-East Coast, where 40 cycles is the standard frequency, this means 2,400 r.p.m.—and building the largest set mechanically possible at that speed, meant a turbine with a maximum continuous rating of 20,000 kW of a two-cylinder single-shaft design, but with the experience then available a single generator of 20,000 kW at 0.75 power factor could not be built for 2,400 r.p.m. Accordingly, each set was

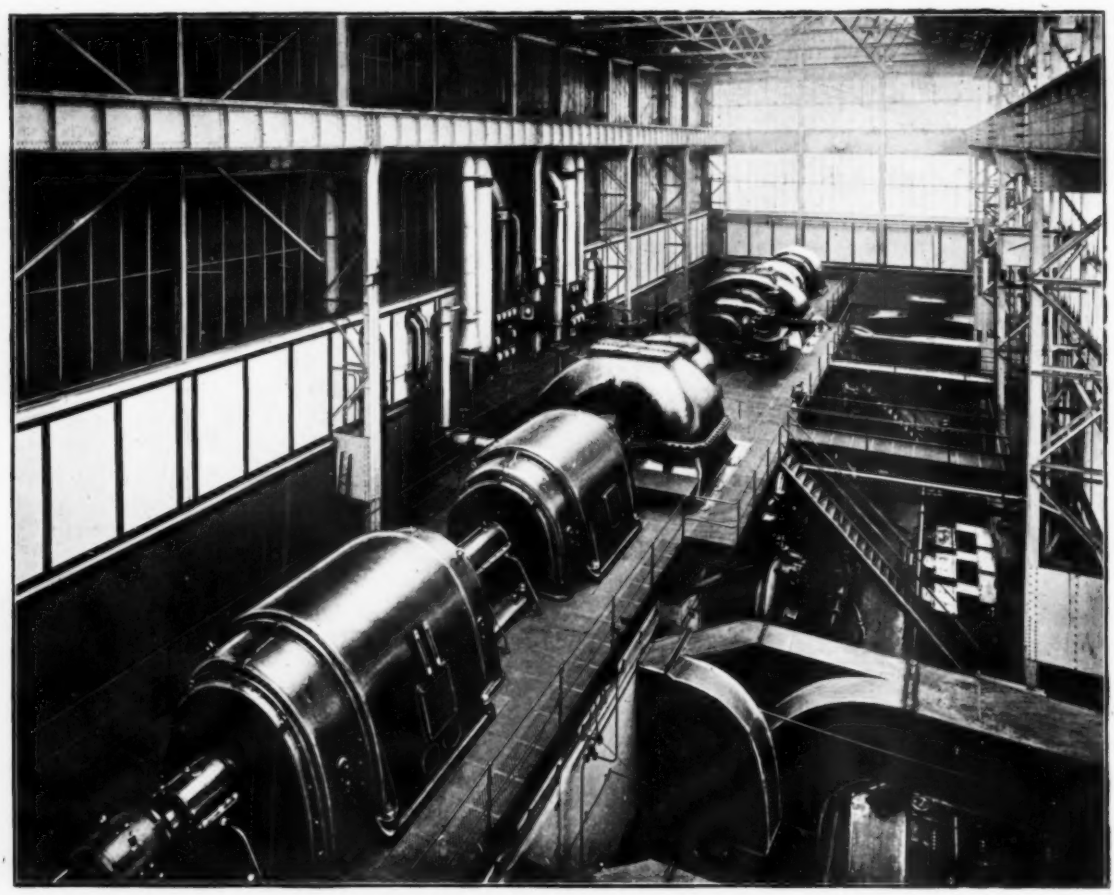


**Fig. 5.—North Tees Power Station: Turbine Room.**

equipped with two 10,000-kW generators permanently connected mechanically in tandem and electrically in parallel, with a single exciter. Advantage is taken of this arrangement to deal with the possibility of a generator breakdown by putting non-automatic switches between the two generators and the main automatic circuit breaker controlling the set so that either generator can be operated alone. A jack shaft is also provided to take the place of a rotor should it become necessary to remove the latter for repairs. Each generator is also specified to carry the economical load of the turbine—namely, 16,000 kW—at unity power factor with a slightly higher temperature rise than normal. The outgoing air from the generators is discharged into the inlet of the forced-draught fans for the boilers, thus recovering a portion of the generator losses.

The reheating of the steam between the high- and low-pressure cylinders is carried out by leading the steam to heaters forming an integral part of some of the boiler units. Partially with this in view, and contrary to the arrangements at Carville and Dunston, the boiler house is parallel to the engine room, the turbo-alternator sets being arranged lengthways in the engine room. Of the ten boilers, one row of five backs on to the engine room and is equipped with heaters, so that a relatively short amount of piping is required. The only special feature about reheating is the precaution taken to prevent the accumulation of steam in the reheater from causing the turbine to "run away and trip" if the load suddenly falls to zero. This is done by a special relay which operates a valve to by-pass the steam from the reheaters direct to the condenser.

The general design of the boiler plant is similar to that of the ordinary marine-type boilers used at low pressures, but the tubes are smaller and the drums are of smaller diameter and made of thicker plate. The fittings, of course, required to be of special design, as did the steam and water pipe flanges and valves. In practice, the only difficulties arising out of the higher pressure have been the liability of the gauge glasses to fracture and the cutting of the seats of the valves. These difficulties are gradually being overcome by the judicious choice of materials and types of fittings for individual conditions. The air heaters are of the simple tubular type, but have spiral retarders inside the tubes which not only assist the heat transfer but also enable any deposit of dust from the flue gases to be readily cleaned out.

As regards the station auxiliaries, the well-known unit principle first adopted at Carville in 1904 has again been used. While originally designed for the purpose of giving the maximum security of supply to auxiliaries, this system is also claimed to be the best thermodynamically, as all the steam is used in the most efficient way in the main sets as compared with methods in which special house turbo-generators are installed. This principle was extended by the installation of steam turbine-driven feed pumps merely as a stand-by, the normal operation being to run the electrically-driven

pumps, the energy for which is produced efficiently by the main turbines. It will be appreciated that the electric drive of all auxiliaries is much more important in stations where bleeding for feed heating is adopted, as no exhaust steam from auxiliaries is required for feed-heating purposes.

Due principally to the serious depression of the shipbuilding, iron, and steel industries during the last few years, the North Tees station is only just reaching a stage at which it can be operated under favourable conditions; therefore, although in 1923 it headed the list of stations of its class in the Electricity Commissioners' tables with an average coal consumption of 1.73 lb. per kWh generated during the year, it has not yet achieved in commercial service over long periods the expected weekly operating thermal efficiency of 21 per cent. Tests on the plant indicate, however, that this figure will be attained as soon as industrial conditions allow of a reasonable load being carried by the generating sets at night and at the week-end. The station, of which fig. 2 is a general view, was constructed to the designs and under the supervision of Messrs. Merz and McLellan, consulting engineers, and the details of the plant are as follows: The Babcock & Wilcox water-tube boilers, fig. 4, number 10, of which five are fitted with reheaters; the heating surface of each of the latter is 6,756 sq. ft., of the superheater 3,050 sq. ft., of the reheater 3,490 sq. ft., of the air heater 10,560 sq. ft., the grate area being 196 sq. ft. No water economisers are used. The normal evaporation of each boiler is 42,000 lb. per hour with 25 per cent. continuous overload capacity; the normal capacity of each reheater is 75,000 lb. of steam per hour, the pressure of the steam reheated being 65 lb. per sq. in. above atmosphere, the entering and leaving temperatures being 350 and 520 deg. F. respectively. The outlet temperature of the flue gases from the air heaters is 300 deg. F., and the temperature of the air entering the travelling grate stokers is 350° F.

Four forced- and four induced-draught fans of the Davidson "Sirocco" type are provided, the former being driven by 90-h.p. and the latter by 120-h.p. variable-speed slip-ring motors.

The coal-handling plant consists of two steel-plate 50-ton receiving hoppers, with duplicate coal crushers and filler plant, situated underneath and feeding two gravity-bucket 40 tons per hour conveyors which deliver the fuel into the 800-ton bunkers above the boiler house; 30,000 tons of coal can be stored on site with the existing siding accommodation. The ash and soot plant consists of central air-exhausting machinery with two 50-ton ash bunkers, fig. 2; the two exhausters are each capable of dealing with 14 tons of ash per hour, and two movable ash crushers are provided. Messrs. Babcock & Wilcox, Ltd., were the main contractors for the whole of the boiler house plant.

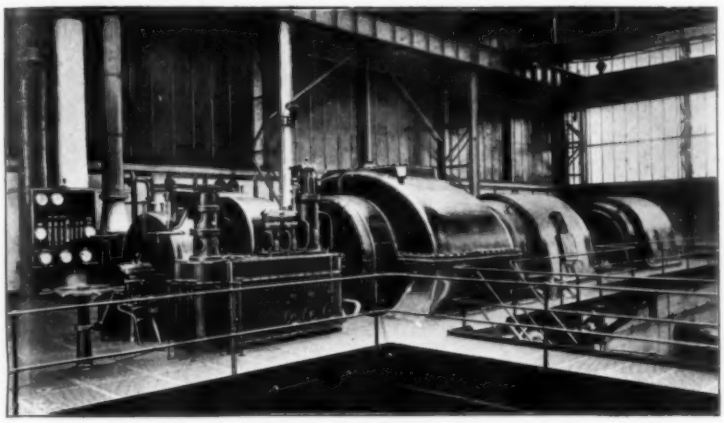


Fig. 6.—A 20,000-kW Turbo-generator.

The Metropolitan-Vickers Electrical Co., Ltd., was the main contractor for the turbo-generators and condensers; two sets are installed, fig. 5, each having a maximum continuous rating of 20,000 kW at a 0.75 lagging power factor, the economical rating being 16,000 kW, and the speed 2,400 r.p.m. The type of turbine is the two-cylinder Rateau, with one Curtis wheel, and 6 h.p. and 10 l.p. stages. Steam is bled from the machines for boiler feed-water heating purposes at the 80, 17, and 5 lb. per sq. in. pressure (absolute) stages, the water being heated to 300 deg. F.

Each turbine drives two 40-cycle, 11,500-volt alternators, as shown in figs. 5 and 6; each set has an overhung 220-volt exciter with a radial commutator. There are eight bearings, and the ventilation is partly by fans on the rotors and partly by independent motor-driven fans. The air passes through Heenan filters, and is discharged into the boiler-house forced-draught system. External oil-cooled reactances are used.

Each set has one condenser with a cooling surface of 25,000 sq. ft.; the tubes are 1 in. in external diameter, and the quantity of water needed is 26,000 gallons per minute. Each of the Le Blanc rotary air pumps is coupled direct to a 400-b.h.p. motor, which also drives the alternator ventilating fans. Each of the three Gwynnes vertical centrifugal condenser water pumps has a capacity of 26,000 gallons per minute at a 27-ft. head, and is driven at 343 r.p.m. by a 400-b.h.p. motor; the pumps are charged by two motor-driven air exhausters, and the water screens are of the Brackett endless-belt pattern inclined to the vertical.

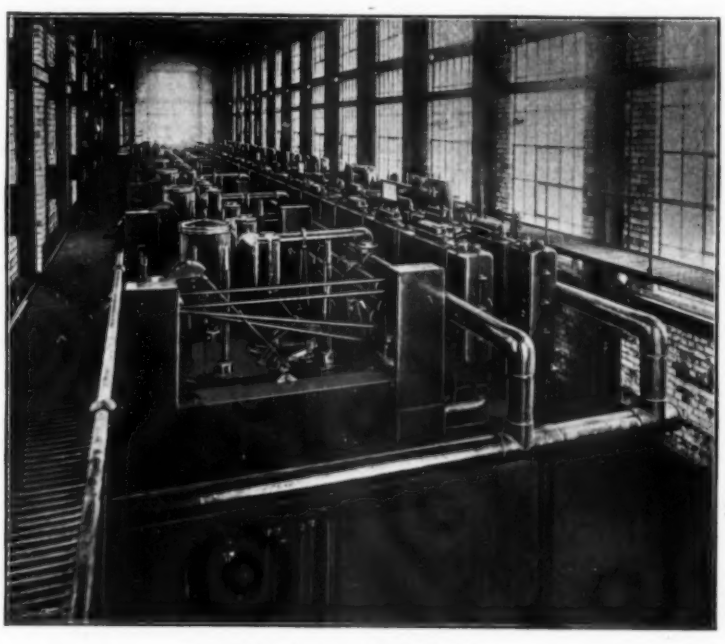


Fig. 7.—Armourclad Switchgear.

In the condensate system the condensate pump delivers to the open hotwell; the lift pump discharges

through the drain, low- and intermediate-pressure and gland heaters to the boiler feed pumps; the last delivering through a h.p. heater to the feeding range. Two Mather & Platt electrically-driven boiler feed pumps are provided, with two Weir steam turbo-driven sets as a stand-by, the capacity of each being 250,000 lb. per hour.

The station control room is illustrated in fig. 8, while fig. 7 is a view of the Reyrolle armourclad "M" type switchgear; there are two sets of bus-bars, and the generators are protected on the self-balancing system.

During the past winter the combined load of the North-Eastern Power Companies reached 165,000 kW, of which 60,000 kW was carried by Carville, 51,000 kW by Dunston, and 25,000 kW by North Tees, the remainder being distributed over the waste-heat stations and other smaller plant. With the revival of trade a further rapid increase is anticipated, and extensions to the North Tees plant are already well in hand.

A few other interesting features in connection with the North Tees station may be referred to in conclusion. Two battery-driven locomotives, each weighing 27½ tons,

**Fig. 8.—North Tees Power Station: Station Control Room.**

The station transformers are of the Ferranti single-phase type; there are three 1,800-kVA banks, the unit transformer being connected to the terminals of each set, and the station transformer to the main bus-bars as a stand-by for starting. The station auxiliary motors were supplied by the Metropolitan-Vickers Electrical Co., Ltd., with the exception of the stoker motors, which are of the Creedy, 3-phase, multi-speed pattern, by Messrs. F. & A. Parkinson & Co., Ltd. The battery-charging generators and d.c. lighting switchboards were supplied by Messrs. J. H. Holmes & Co.

one of which is shown in fig. 2, handle the traffic on the generating site, in connection with the handling and storage of coal and the disposal of ashes. For the purpose of laying some 20 cables across the Tees a trench was dredged in the river bed. The conditions of dredging and of cable laying were somewhat difficult as the river is navigable and subject to large tides, while its width at this point is over 400 ft. The cables had to be laid specially deep in order to provide for future dredging to increase the depth of the navigable channel.

# Shanghai Electricity Supply.

## The Riverside Power Station.

THE Shanghai Municipal Electricity Department had an installed plant capacity of about 550 kW in 1901, a maximum load of 320 kW, and a sale of 568,690 kW-hours. At the end of 1923 the installed capacity was 121,000 kW, the maximum load on the station 65,632 kW, and the output was 272,265,861 kW-hours, of which 80 per cent. was sold for power purposes. The number of premises supplied at the close of last year was 39,929. The demand for electricity in Shanghai was steadily increasing up to 1912, when 12,130,537 kWh was sold; since then the demand has risen by leaps and bounds, and it is estimated that the present year will see the sales over 300,000,000 kWh.

In 1911 the new Riverside station was designed, and in April, 1913, it was put into commission with a plant of 4,000 kW (two 2,000-kW turbo-alternators). In 1913

two more machines each of 5,000 kW were ordered and were installed in 1914, additional boilers, switchgear, &c., being added, and the distribution system was enlarged to meet the increasing output. So great was the

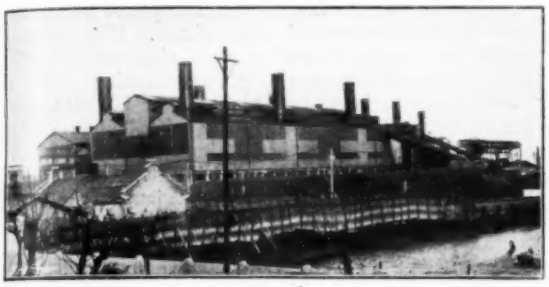


Fig. 1.—Shanghai: Riverside Power Station.

call for electricity that a further extension was embarked upon in 1915, and installed during 1916-17. This consisted of one 5,000-kW set and two 10,000-kW sets. In 1917, another turbo-alternator was ordered, of

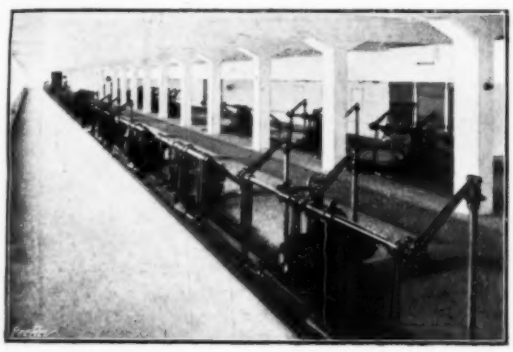


Fig. 2.—Oil Circuit Breaker Mechanism, 22,000-V Switch House.

18,000 kW, and a similar set of the same size was ordered the following year.

The extensions recently completely comprise two 20,000-kW sets and two 3,000-kW sets (the two latter for house service use). Additional 22,000-volt switchgear, for the control of 86,000 kW of generating plant, feeders, &c., has also been put into service. Five Babcock and Wilcox marine-type boilers and five Stirling boilers, each having a normal evaporative capacity of 80,000 lb. of water per hour, complete the last extension (No. 3 boiler house).

The plant was built by the undermentioned contractors: Two 2,000-kW sets, A.E.G.; one 5,000-kW set, Fraser & Chalmers; two 10,000-kW sets, by the General Electric Co., of New York, one of them replacing two 5,000-kW machines of another make which had failed; one 10,000-kW set, by Parsons & Co.; two 18,000-kW sets, by the General Electric Co., of New York; one 20,000 and also two 3,000-kW sets, by the Metropolitan-Vickers Co.; and one 20,000-kW set, by Parsons & Co. The 22,000-volt main switchgear was supplied by the British Thomson-Houston Co., and the 6,600-volt main switchgear by the General Electric Co., of New York. In boiler houses Nos. 1 and 2 the boilers are all of Babcock & Wilcox make. Generation is at 6,600 volts, at which pressure three of the smaller machines feed into the main 6,600-volt switchgear; all the other generators are each tied to the main 22,000-volt switchgear through step-up transformers.

Except for a portion of the supply area fed directly at 6,600 volts, the bulk of the energy is transmitted at 22,000 volts by underground, armoured, split-conductor cable to three super-sub-stations, one situated two miles from the power station, the second five miles, and the third 10 miles away. At these centres it is stepped down to 6,300 volts, and fed into the numerous sub-stations within their respective areas by underground cable.

The capital outlay of the undertaking at the end of December, 1923, was Tls.29,509,162 (at present exchange equal to about £5,500,000). The financial return on the capital outlay last year was 10.39 per cent.

A large part of the output is taken by flour and cotton mills, and the load factor is in the neighbourhood of 50 per cent. The total connections at the end of 1923 amounted to 114,950 kW, the motors connected to the system being rated at 101,330 h.p. Heating and cooking are making good progress, there being over 3,000 radiators and 835 kW of cooking apparatus connected—a total of 8,216 kW—at the end of 1923.

Mr. T. H. U. Aldridge, M.I.E.E., M.I.Mech.E., Fel.A.I.E.E., engineer-in-chief and manager, has been

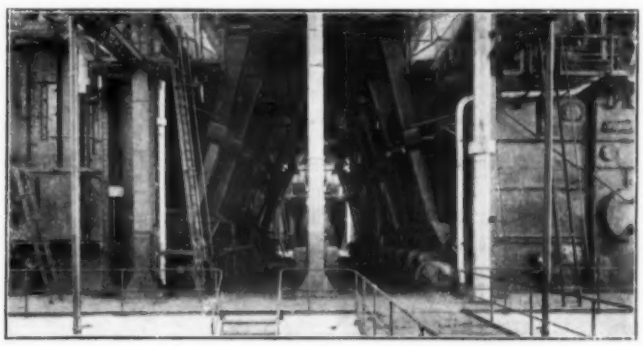


Fig. 3. Centre Bay of No. 3 Boiler House, April, 1924.

in charge of the undertaking since 1901, and has been directly responsible to the Electricity Committee for the development and management of the concern, and he, and certain members of his staff, have been entirely

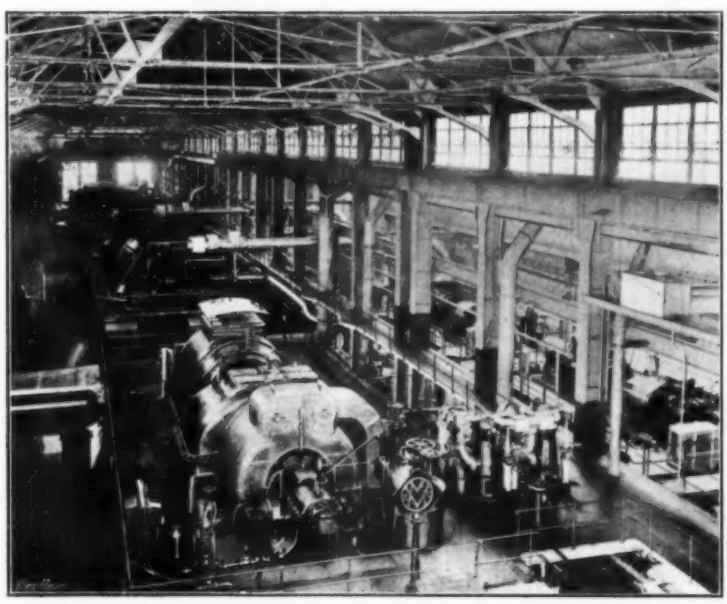


Fig. 4.—Interior of Turbine Room, March, 1924.

responsible for the successive extensions which have from time to time been carried out.

# Electric Power on the Rand.

ONE of the oldest and also by far the largest electrical installation in South Africa is that of the Victoria Falls and Transvaal Power Co., Ltd., which, in conjunction

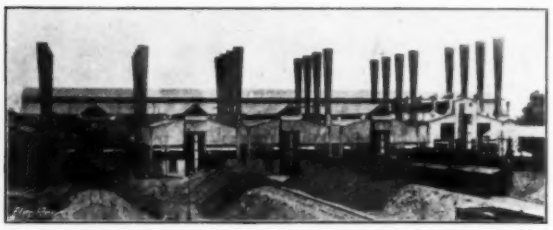


**Fig. 1.—Victoria Falls & Transvaal Power Co.: Rosherville Generating Station.**

with its subsidiary concern, the Rand Mines Power Supply Co., Ltd., supplies the principal gold mining companies on the Rand with electric power.

The company has four electricity works in operation on the Rand, *viz.*, at Brakpan, Simmer Pan, Rosherville, and Vereeniging, the last-named being near the collieries 35 miles away, where also an ample supply of river water is available. All the stations work on the three-phase 50-cycle system, the whole comprising 21 generating sets of a total capacity of 216,000 kVA.

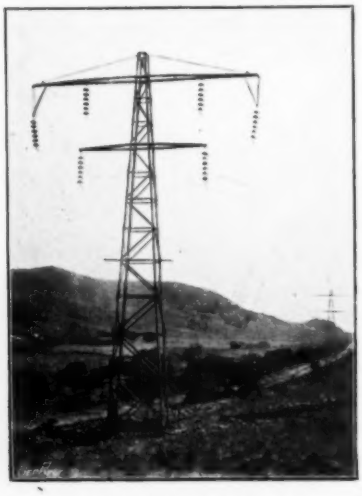
The largest individual generating plant is that at Rosherville. The buildings are of steel construction, and at the rear is a huge coal storage yard provided with a system of conveyors. The boiler house contains Babcock & Wilcox marine-type boilers arranged in groups of eight, two boilers being connected to one chimney stack. The boilers are equipped with superheaters and economisers, and the Prat system of induced draught is in use. The generating plant comprises five 5,000-volt turbo-alternators each producing 12,000 kVA at 1,000 r.p.m. In addition, there are six 3,500-kW and three 7,000-kW turbo-driven air compressors, seen at the far end of the illustration of the turbine room, fig. 2. The transformer plant consists of five sets stepping-up the pressure to 42,000 volts.

**Fig. 2.—Rosherville Turbine Room.**

The Vereeniging station, which comprises four 10,000-kW sets, is run at the highest possible power factor so that the minimum current is transmitted. The plant is connected by an 80,000-volt line approximately 35 miles long with the Robinson Central distributing station, where the pressure is reduced to 40,000 or 20,000 volts.

The 80,000-volt line, which transmits 60,000 kVA, with the neutral point earthed at both ends, is carried on lattice steel masts with a span of 492 ft., every fourth mast being of the anchor type, of sufficient strength to withstand the full strain of the conductors. Anchor masts are also used when the line changes direction and at railway crossings. The conductors are spaced 9 ft. apart, the lowest point being 34½ ft. above the ground. The insulators consist of six suspension disks in series on the intermediate masts.

The 40,000-volt system is fed at four points, *viz.*, at Brakpan, Simmer Pan, Rosherville, and Robinson Central. In addition to these distributing stations, the transmission lines pass through two distributing stations at Hercules to the east and Bantjes to the west. From these six points, distribution networks, laid out as ring mains, supply the various sub-stations at the mines. On the 40,000-volt lines pin insulators are employed on intermediate masts, and four disks on each string of insulators on the main masts. All the switching control is concentrated at the Simmer Pan station, which is in telephonic communication with all parts of the system.



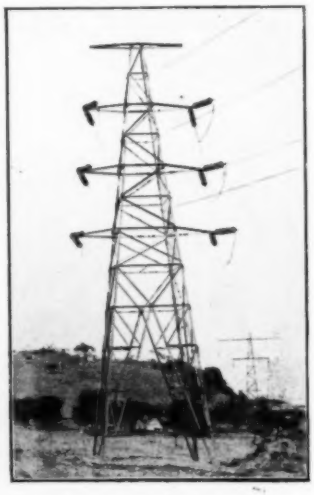


**Fig. 3.—Intermediate Mast. Fig. 4.—Anchor Mast. Vereeniging-Rand 80,000-V Transmission Line.**

Electricity is supplied to the mines at a pressure of either 2,100 or 525 volts. Altogether there are 84 sub-stations, many of over 4,000 kW capacity. The transformer installation has an aggregate capacity in large units of 382,000 kVA and in smaller sets of 302,000 kVA.

The generating sets at the various stations on the Reef are continuously loaded up to the limiting temperature, which is determined by measuring the resistance of the rotor windings while running. All the large generators on the system, with the exception of those at Vereeniging, are protected by reactances between the generator terminals and the primaries of the transformers. These reactances reduce the voltage by about 6 per cent. when the full load is on. The average "monthly system load factor" of the complete plant is from 70 to 72 per cent.

# Electricity Supply at St. Louis, U.S.A.

## The New Cahokia Pulverised-fuel Power Station.

In order to meet the ever-increasing demand for electricity in St. Louis, the limit of capacity having been reached at the existing stations, the Union Electric Light & Power Co., in September, 1922, commenced the construction of a plant at Cahokia on the Illinois side of the Mississippi River, which ultimately will comprise eight, or possibly ten, sets, each of from 30,000 to 35,000 kW capacity. The site selected for the station is one of 52 acres, consisting largely of sand and silt deposited by the river. This necessitated the construction, for the first two of the four contemplated sections, of a river wall resting on 259 75-ft. concrete piles. The buildings for the first two sections measure 326 ft. in length, parallel to the river, by 221 ft. in width, to secure a solid foundation for which no fewer than 4,509 concrete piles had to be driven in the river and adjoining land. The station is laid out with the outdoor transformer bays and electrical gallery next to the river, the turbo-generator room, boiler house, and the coal receiving and preparing installation being landwards in the order mentioned. The Babcock & Wilcox boilers, four in number for each generating set, are 38 ft. wide and 20 ft. high, with tubes 4 in. in diameter and 20 ft. long, giving a total heating surface for eight boilers of 18,010 sq. ft., with a superheater surface of 4,070 sq. ft. With one boiler normally out of service for cleaning or repairs, the remaining seven are able to furnish the steam for the section load of 60,000 kW. They are designed to work up to a pressure of 350 lb. per sq. in., but the normal adopted is only 300 lb. Although space is available for economisers and induced-draught fans, or for air preheaters, it was decided that any outlay in this direction was not justified by the existing cost of fuel. At present, therefore, natural draught is employed in conjunction with tile and reinforced-concrete chimneys, 325 ft. high above the burners, four boilers being connected to each of the chimneys, which are 19 ft. in diameter at the top.

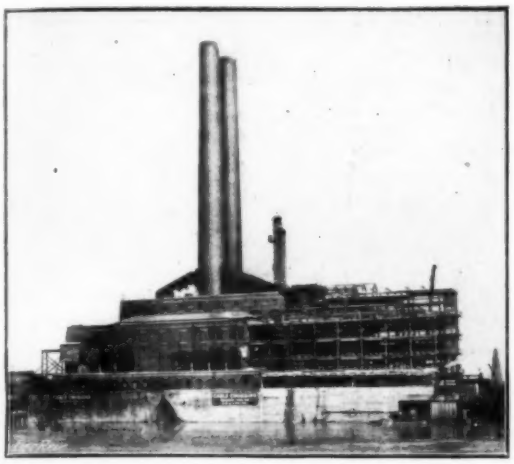


Fig. 1.—First Two Sections of Cahokia Power Station (April, 1924) showing Flue Connections to Chimneys.

One of the features of the installation is the adoption of pulverised fuel after exhaustive tests of three types of forced-draught chain-grate stokers at the stations of the Commonwealth Edison Co. and the Cleveland Electric Illuminating Co., and of underfeed-stoker and pulverised-fuel installations at the works of the Milwaukee Electric Railway & Light Co. The results showed a reduced fuel consumption in favour of pulverised coal of 4 per cent., representing a substantial annual financial economy. The coal, which has 12 per cent. moisture, is pulverised at the station; it is first dried in waste heat driers, through which it passes by gravity to the Lopulco pulverisers, of which there are eight, each of a capacity of 6½ tons per hour. As a result of experience, arrangements are in hand to replace them by 15- and 20-ton pulverisers, which will occupy only a slightly increased space. From the pulverisers the fuel is delivered to transport tanks which are supported, for recording purposes, on platform scales, and thence by

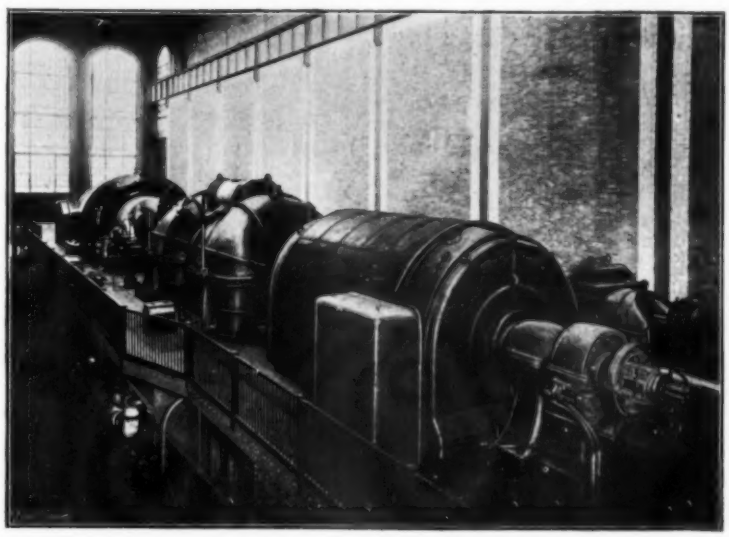


Fig. 3.—Cahokia 30,000-kW Turbo-Generators.

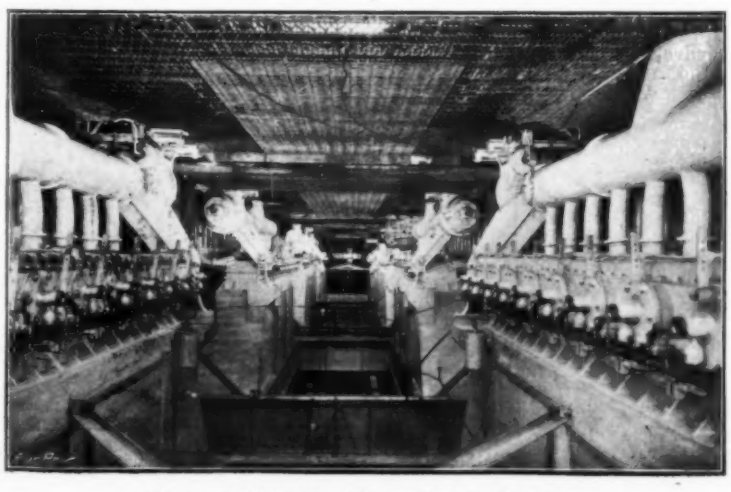


Fig. 2.—Cahokia Boiler House; Fuel Feeder Level.

compressed air through 4-in. pipes to bins above the boilers. From the bins the fuel flows by gravity to the

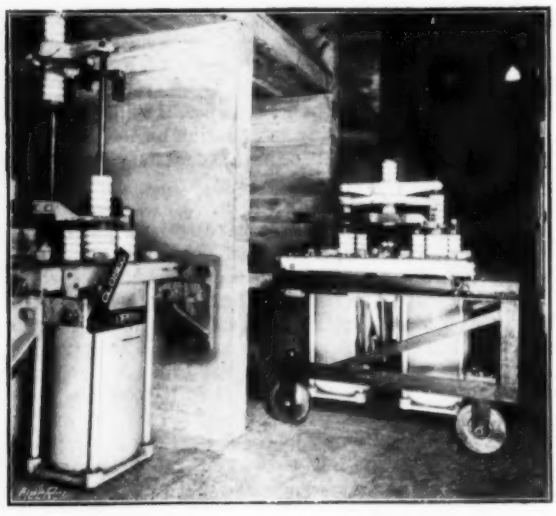


Fig. 4.—Cahokia Power Station: Oil Switches.

feeders below them, where it is mixed with about 15 per cent. of the air required for combustion, the air being drawn through the hollow furnace bottoms by four Sturtevant fans and consequently preheated. Each boiler is provided with ten screw fuel feeders, the screws being connected by clutches to a common shaft, driven by Westinghouse 15-h.p. d.c. motors. The balance of air required for combustion is drawn by the chimney draught through hollow side walls. Although pulverised fuel is at present employed, provision has been made for the installation of low-temperature coal distillation plant when this reaches a commercial stage, the boiler furnaces being also so arranged that distillate firing can easily be adopted.

Owing to the high cost of foundations for the buildings, the electrical equipment is located on several floors one above the other, the 13,800-volt circuit breakers being above the generating and control rooms, and the 2,300-volt and 440-volt gear on the lowest floor. The turbine room is hardly more than an operating gallery round the generators, thus providing light and ventilation to the condenser floor. The turbines are placed end to end, with the steam ends over a single condenser pit. The plant, which is operated in parallel with a steam station in St. Louis, generates three-phase 60-cycle current; it is also connected with a hydro-electric 25-cycle plant at Keokuk through a 5,000-kW frequency changer. The initial plant, which was put in operation on October 17th, 1923, comprises two 30,000-kW, 13,800-volt, 85 per cent. power factor, 1,800-r.p.m. sets, one of which consists of a Curtis turbine and G.E.C. generator, and the other of a Parsons-Westinghouse combination. Each is equipped with a water-circulating pump and Worthington 53,000 sq. ft. surface condenser located in a single oval-shaped well approximately 42 ft. below the main sets.

The second section of the plant now in course of completion will comprise one 30,000- and one 35,000-kW sets. Two of the three 30,000-kW machines are of the 17-stage impulse type, one being equipped for single-stage and the other for four-stage steam extraction for feed-water heating. The other two are of the reaction type, one being double flow with single-stage extraction and the other single flow multiple exhaust with four-stage extraction. Two Parsons-Westinghouse turbo-generators of 2,500-kW 2,300-volt capacity, running at 3,600 r.p.m., are also installed for starting-up and emergency purposes. It is expected that the second section will be in operation before the end of the present year, when the capacity of the plant will be 125,000 kW.

All auxiliaries are driven by electric motors, except one boiler-feed pump for starting-up and a duplex-driven generator which serves as an emergency exciter and as an emergency supplier of power for the fuel feeders. The auxiliary motors aggregate 6,000 h.p. River water is utilised for steam-raising and condenser circulation; it is first treated chemically in settling tanks, and evaporated by low-pressure units. Means are provided to supply air-free water at a temperature of about 210 deg. F. to the boilers.

The transformer plant comprises two G.E.C. 3,000/2,000-kW, 3-phase, 13,800/2,300-V combination self- and water-cooled transformers, three 12,000-kW, 3-phase, 13,800/33,000-volt forced- oil-cooled transformers for the St. Louis (Ashley station) connecting line; three 7,500-kW, 13,800/33,000-V transformers for the sub-station feeders, and two 750-kW, 2,300/460-volt, 3-phase Westinghouse transformers for the station service. The 13,800/33,000-volt outdoor transformers are mounted on the roof of the river bay, and from them connections are made to 3-phase submarine cables.

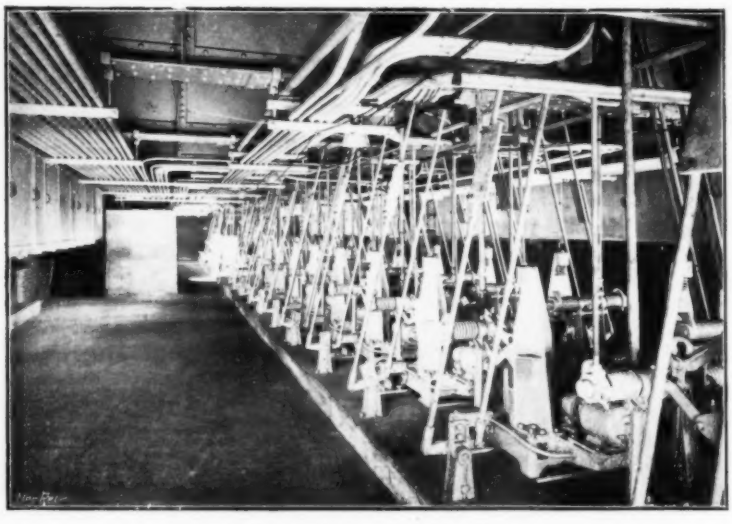


Fig. 5.—Circuit-Breaker Mechanism

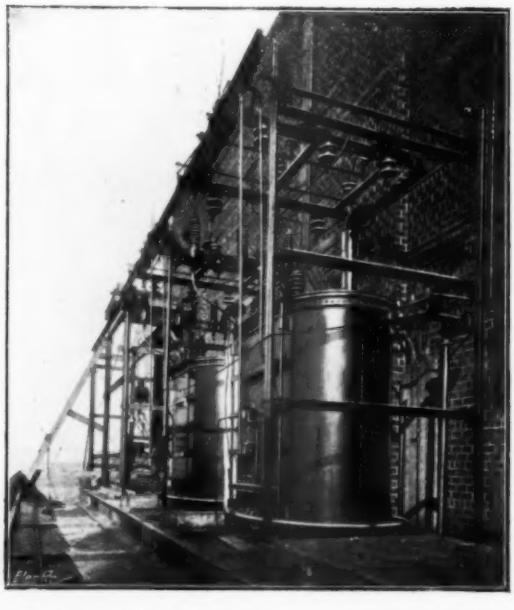


Fig. 6.—Cahokia Outdoor Three-phase 13,800/33,000V Transformers Feeding Submarine Cables.

The submarine cables consist of twelve 350,000-cm., 3-conductor, 33,000-volt, paper-insulated, lead-covered and armoured cables laid across the bottom of the Mississippi river between Cahokia and St. Louis. The local demand on the station side of the river is supplied by overhead lines at the generator voltage (13,800 V).

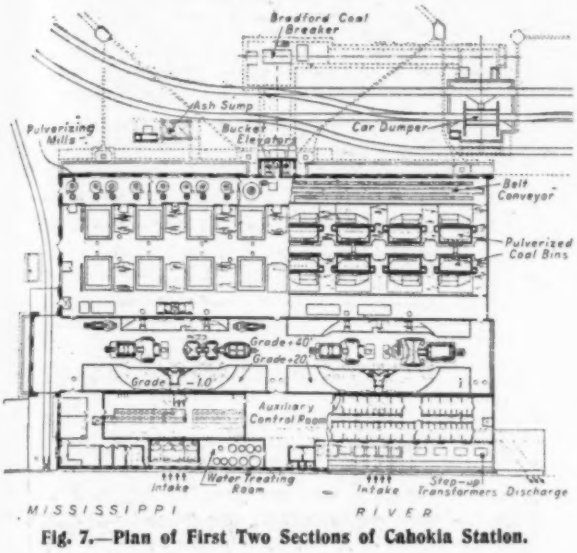



**Fig. 7.—Plan of First Two Sections of Cahokia Station.**

Plans are also in hand for an outdoor transformer station and steel-tower transmission line to supply Crystal City, 40 miles from St. Louis on the Missouri side of the river.

In the electrical bay, between the turbine room and the river, all the units and feeders are connected to a 13,800-volt bus with sectionalised main ring, a reserve bus being provided. The switchroom equipment comprises G.E.C. oil circuit breakers, motor-operated for

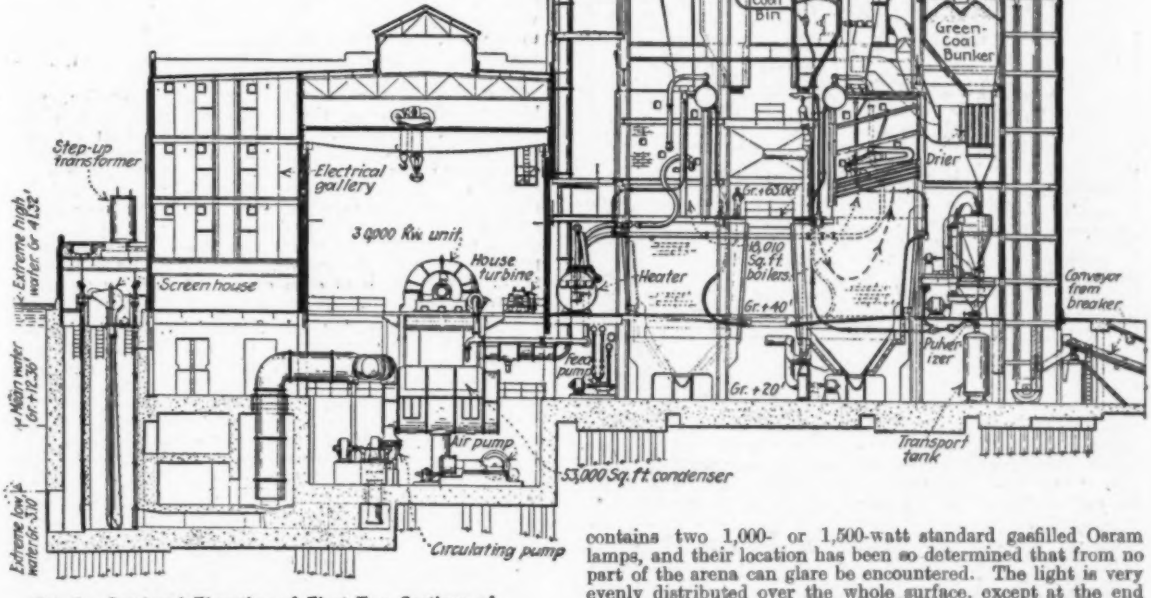



**Fig. 8.—Sectional Elevation of First Two Sections of Cahokia Station.**

isolated phase arrangement, separated vertically and gang-operated, manually controlled, disconnecting switches interlocked with oil-circuit breakers for 13,800 volts; Westinghouse oil-circuit breakers and electric power equipment disconnecting switches and bus insulators for the 2,300 and 440-volt equipment, G.E.C. single-phase 13,800- and 2,300-volt reactors, &c.

Although the work of erecting and equipping the station occupied a period of only thirteen months, the tests conducted to date on the first section (60,000 kW) of the plant indicate that it is performing as well as was anticipated. The figures for the month of March last and for the first half of April are summarised below:—

| | B.th.u. per kWh. gross. | net. | Max. load kW. | Capacity factor. | Net output, kWh. |
|---|---|---|---|---|---|
| March (31 days) | 16,941 | 17,965 | 45,000 | 49.1 | 21,923,000 |
| April (15 days) | 16,604 | 17,582 | 50,000 | 49.0 | 10,578,600 |

There are many interesting features in connection with the Cahokia station, which was designed and erected by Messrs. McClellan & Junkersfeld, Inc., of New York, under the instructions of Mr. Louis H. Egan, president of the Union Electric Light & Power Co., of St. Louis, and with the collaboration of Mr. H. W. Eales, chief electrical engineer of the company, and of Mr. E. H. Tenney, chief engineer of power plant. The consulting architects were Messrs. Mauran, Russell and Crowell, of St. Louis.

## Notes.

**Flood-lighting the Wembley Stadium.**—In order to make it possible for the Rodeo contests to be continued after nightfall, the British Empire Exhibition Stadium arena has been effectively flood-lighted. The transition from daylight to darkness is not observed by spectators of the contests, because the flood-lights are switched on before daylight commences to wane; in this way the eye accommodates itself to the gradual change from natural to artificial light. Twenty projectors are fitted on each side of the arena under the covered stands; each contains two 1,000- or 1,500-watt standard gasfilled Osram lamps, and their location has been so determined that from no part of the arena can glare be encountered. The light is very evenly distributed over the whole surface, except at the end where the entry gates are situated. There a few projectors are situated close together, the object being to provide a higher intensity of light at the point of entry into the arena, thus enabling the cowboys to see "outlaw" horses and steers more easily. The work was carried out by Electrical Installations, Ltd.

**Social Events.**—The 14th annual outing of the South Metropolitan Electric Light and Power Co., Ltd., took place on June 21st. A party of 65 proceeded to Southend-on-Sea, and dined at the Royal Hotel. Mr. J. A. Constable (resident engineer, Generation Department), who has been with the company from its inception, was presented with a silver rose-bowl.

The employés of Messrs. E. Brook, Ltd., chose the British Empire Exhibition for their annual outing on June 21st. The party left Huddersfield at midnight, June 20th, and upon

arriving in London made a short tour. Several hours were spent at the Exhibition, and the return was commenced very early in the morning of June 22nd.

On Saturday last nearly 3,000 employés of the Metropolitan-Vickers Electrical Co. from their Trafford Park works paid a visit to the British Empire Exhibition. The yellow ribbon badges with the M-V monogram in the well-known hexagon were conspicuous in all parts of the grounds. The excursion from Manchester Central to Marylebone started on Friday night and the party returned on Saturday night from Wembley Hill station. An early morning drive round the London sights in motor 'buses was part of the programme, which went through without any serious hitch.

The staff and employés of the Tunbridge Wells Corporation Electricity Works went to Margate for their annual outing, *via* Goudhurst, Charing, Chilham, and Canterbury. The dinner took place at the West End Hotel, tea was taken in Canterbury, and the party also stopped at Goudhurst for an hour, holding a concert at the "Star and Crown" Inn.

G.E.C. SPORTS.—The annual sports organised by the General Electric Co. on the Herne Hill track took place on June 28th; no fewer than 10 challenge cups were competed for, the events for both ladies and men being open to all works and branches of the G.E.C., in addition to other prizes. Each event was keenly contested, and some very close finishes were witnessed. The prizes were distributed by Mrs. M. J. Railing, following appropriate speeches by Mr. M. J. Railing and Mr. E. Wilson. The G.E.C. band from the Lemington Glass Works was in attendance throughout the afternoon and after the distribution of prizes played for dancing.

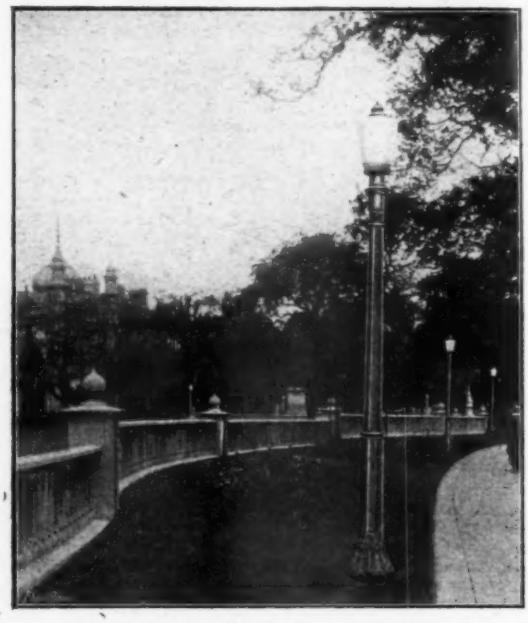
**Electricity at a Hospital Carnival.**—Hackney electricity scored a great success at the Metropolitan Hospital carnival held on Saturday last, June 28th. The Borough Electricity Department exhibited an electric lorry arranged as an electric kitchen, and cooked cakes *en route*, while boiling kettles and oscillating fans were also in operation. After the carnival, the car paraded the main streets of the borough illuminated with coloured lamps, some 350 lamps being used for this purpose. The exhibit was arranged by Mr. P. M. Shears, the sales engineer, he and one of his assistants, Mr. Sharp, taking the characters of the two chefs. The

**Electrical Demonstration Car in a North London Carnival.**

supply for the cooker, the lighting, &c., was taken from a Chloride Co.'s "Exide" battery. The exhibit was a very great success, and the publicity achieved was extremely good. There were also displayed at the back of the stand electric light fittings, irons, toasters, and fires, which gave a very pleasing effect. A "Tricity" cooker was used. The cakes that were made *en route* were sold to the crowd. Fancy prices were asked, and as the idea of electrically-cooked food caught on, the sales very largely augmented the funds available for the hospital.

**Decorative Street Lighting.**—Decorative street-lighting fittings have not been hitherto very extensively used in this country, although in America "White Way" lighting has found great favour, and is extensively used in the important business centres, parks, &c. The essential feature of this system of illumination is that, instead of tall standards spaced from 100 to 200 ft. apart, with high-wattage gasfilled lamps, smaller posts are employed with low-wattage lamps and diffusing fittings of decorative design.

An installation of this type has recently been carried out by the Brighton Corporation (electrical engineer, Mr. J. Christie), the posts and fittings being designed and supplied by the Metropolitan-Vickers Electrical Co., Ltd. An experimental installation of 14 pillars was made in the Steine Gardens, which were formerly very indifferently lighted by the street lamps which illuminated the main thoroughfares round the gardens. This installation proved so



**Decorative Street Lighting at Brighton.**

satisfactory that it was decided to carry the same scheme all through the gardens from Preston Park to the Front, the whole valley having been opened up as a great garden walk to the sea. A further 85 posts were erected amongst the bushes and foliage, and the resultant lighting effect, from an artistic point of view, is very pleasing.

The post is of cast iron, octagonal in section, with a hinged door in one of the base panels for access to a double pole switch and fuses. This is an independent control, as the lamps are arranged in groups, which can be switched on or off from one central point. The spigot carries a 7½-in. cast gallery suitably arranged so that water running between the globe and gallery can drain off. The globes are made from good-quality opal glass, and the contour is so designed to give a favourable light distribution, throwing as little light as possible above the horizontal. The lamp used is 100-W gas-filled. The finial is of steel enamelled black, with provision for ventilation.

**National Association of Supervising Electricians.**—On Saturday last the Association made an official visit to the British Empire Exhibition, lunching together, and holding a national gathering in one of the Conference halls in the afternoon. The president, Mr. W. E. Highfield, presided at the meeting, and offered a hearty welcome to the members and their ladies. In the course of a brief address, he laid stress on the educational activities of the Association, which aimed not only to raise the status of the individual, but also to elevate the individual himself. In this respect the Association, he claimed, had gone further than any similar association in this country, inculcating good citizenship as well as membership. Mr. T. H. Windibank addressed the meeting, pointing out that education enabled the members to make themselves worthy of the claims which union enabled them to put forward, and urged each member to bring in new members who were eligible for admission—they rejected as many applications as they accepted, to maintain a high standard. The secretary, Mr. A. Brammer, also invited the members to support the Board of Control in this way. Mr. W. E. Highfield then introduced the president-elect, Mr. Frank Gill, M.Inst.C.E., past-president I.E.E., who took the chair, and Mr. R. W. J. Stark moved a vote of thanks to the retiring president, pointing out that by presenting a shield for competition he had elicited from the members remarkable results in the shape of excellent papers, and the scholarship scheme which he had introduced was of great value to the Association; members in the Provinces could compete for these advantages.

Mr. W. J. Revell offered welcome to the new president, assuring him of the hearty support of the members and

Board of Control, and Mr. Gill, in reply, expressed appreciation of the work that the Association was doing. A vote of thanks was also accorded to the hostesses of the N.A.S.E., especially Mrs. Highfield, for their interest in the work of the Association.

**The Ownership of Public "Utilities."**—In its annual report the Committee of the Association of Burgh Officials of Scotland makes reference to what it describes as the attempt now being made by limited liability companies to obtain the control of electricity undertakings. It views this with concern. In the past, it says, local authorities, in the public interest, and at enormous cost, had acquired tramway undertakings, gas works, and water undertakings after these had been established by private companies. Such undertakings, since they came into the hands of local authorities, have been successfully developed, and the requirements of the districts fully met. These requirements can be further augmented as required by a combination of local authorities. The financial benefits that have accrued through the successful handling of all such undertakings by local authorities have passed to the citizens instead of going into the pockets of shareholders. It would be a retrograde step if electricity undertakings were allowed to pass from the control of local authorities.

**The Aldershot Searchlight Tattoo.**—One of the most popular functions in the social life of Aldershot is the annual Searchlight Tattoo organised for the benefit of the various military charities in the Aldershot Command. Every year the ingenuity of the Royal Engineers is taxed to the utmost to furnish some new feature which shall make this spectacle more beautiful and more impressive, and this year they outdid anything previously attempted by introducing special decorative lighting effects, especially in connection with the musical rides by the Royal Horse Artillery and the Hussars. For the former event, in which eight gun-teams took part, the wheels of both guns and limbers and the barrels of the guns themselves were outlined with 4-V, .5-A "Osram" battery lamps, the current being supplied from accumulators carried on the limbers, while similar lamps were attached to the bridles of the leaders of each team. Approximately, 100 lamps, having a total current consumption of 50-A, were used on each gun. The effect of eight illuminated teams at full gallop in the performance of a complicated ride performed otherwise in total darkness was at once striking and inspiring. More impressive still was the cavalry ride, which this year took the form of plaiting the maypole on horse-back. A thirty-six-foot maypole was used, the thirty-two "ribbons" of which were in reality heavy flexible cables fitted at intervals of four feet with 14-V, 7-W "Osram" decoration lamps coloured alternately white and red and enclosed in special protective wire cages. The pole was surmounted by a large Imperial crown illuminated in the correct colours by "Osram" coloured lamps. For feeding the circuit of the 14-V lamps a special transformer was supplied by the General Electric Co., Ltd. The primary of this transformer, which was installed in a special underground chamber, took its supply from the 220-V military mains, while the secondary winding had tappings to give 10, 12 and 14 V. Additional charm was given to this item when four "G.E.C." floodlights, each equipped with one 500-V gasfilled lamp, were switched on. The royal box was specially treated from the lighting point of view, five "Gecoray" floodlights, each equipped with a 200-W "Osram" gasfilled lamp, supplying a strong but glareless illumination. An interesting example of lighting of a more utilitarian nature was the special music stand lights, two hundred and fifty of which were manufactured by the G.E.C. for issue to the massed bands which played during the evening. In order that the decorative lighting effects provided should not be marred, it was necessary for the lights on the music stand to be well shaded. A reflector designed by the illuminating engineering department of the G.E.C. and equipped with a 4-volt "Osram" bulb was incorporated in a special fitting made to clip on to the music stand, and contained a receptacle for a 3½-V dry battery of sufficient capacity to operate the lamp for the whole performance.

**Power Projects in Australia.**—Proposals for the standardisation of electrical power projects in the Commonwealth are being considered by a conference of representatives of the States, which is meeting in Melbourne. The conference was called by the Federal Treasurer as the result of a resolution passed at the Premiers' Conference last year. At that conference it was decided to appoint a committee of experts of the Commonwealth and States to determine the immediate and prospective power needs of Australia for the next 20 years, to make an inventory of the resources of fuel and water power available for the supply of the demand expected, and to prepare on general lines a comprehensive power plan for the whole of Australia.—*Reuter's Trade Service* (Melbourne).

**Local Society.**—H.F. VALVES.—For his recent lecture before the Croydon Wireless and Physical Society, Mr. C. Creswick Atkinson took as his subject "The Application of High Frequency Valves to Receiving Circuits and the Screening of Aerials." The lecture was made all the more interesting by blackboard sketches and demonstrations with a three-valve set receiving 2LO signals on a frame aerial. At the next meeting Capt. A. G. St. Clair Finlay will lecture on "The Operation of Thermionic Valves in Radio Circuits."

**Restaurant Lighting.**—An effective lighting installation has recently been carried out at the Victoria Mansions Restaurants, Victoria Street, S.W. On the lower ground floor the ceiling fittings consist of 18-in. panelled silk bowls, and on the walls three 3-light Jacobean candle brackets finished in bronze, screened by half-circular silk shades to match the silk bowls. In the entrance corridor are three 14-in. cut glass ceiling bowl fittings and one 10-in. cut glass bowl fitting. The restaurant, on the entrance floor, has 14-in. panelled silk bowl ceiling fittings, and on each table 9-in. table standards with silk domed shades, each fitted with three English cut glass flower vases. On the first floor (see the

**The Lighting of the Victoria Mansions Restaurants.**

accompanying illustration) is an American bar, and from the ceiling are suspended 21-in. panelled silk bowls, while fixed to the walls are 3-light candle brackets of Adams design finished in dull gold. The ceiling fittings are equipped with 200-W "Siemens" gasfilled lamps, 60-W "Siemens" vacuum lamps are used for lighting the table standards, and 20-W "Siemens" candle lamps in the wall brackets. The installation was carried out by Messrs. F. G. Edey & Co. The effect at night is very pleasing, as the design of the electric light fittings harmonises with the decorative scheme in each room.

**Appointments Vacant.**—Charge engineer for the Wolverhampton Corporation Electricity Department. Principal of the Northampton Polytechnic Institute (£1,250). (See our advertisement pages to-day.)

**Electric Power on the Rand.**—CORRECTION.—In the article printed on p. 24 of this issue, the following corrections should be made: fifth line from end of first column, for 3,500 read 3,000; first line of second column, for four 10,000-kW sets read two 10,000-kW and two 12,000-kW sets.

**Imperial College of Science and Technology.**—Employers requiring men who have received a thorough training in the principles of engineering (civil, mechanical, and electrical), and who have obtained the Diploma of the City and Guilds (Engineering) College are asked to make use of the services of the Appointments Board of the above college. (See our advertisement pages to-day.)

**Winston Churchill and Power.**—The word "power" used in the title of this note has nothing to do with that beneficent or dangerous influence which politicians seek to wield in the arena of public affairs. Mr. Winston Churchill may possess brilliant political gifts, but he is not in Parliament at the moment, though with the obscurity prevailing at present nobody can hazard a safe guess as to when he may again be in a position to wield power in the conduct of the affairs of the State. But as is the case with some of the men who are in positions of authority and possibly of power at the moment, power—electric power—has caught him, and he, like them, is impressed with the great part that it is destined to play in the future development of Great Britain. Of course there is really nothing new in what he says on the subject, but we quote his remarks as a further indication of the way political minds are exercised in electrical directions just now. Mr. Churchill was speaking at a dinner of the members of the Federation of British Industries in the Birmingham and West Midland area on June 20th, and the F.B.I. *Bulletin* reports him as stating, as others have done before, that "We had escaped from the exhaustion of the Napoleonic wars by steam, and we should escape from our present exhaustion by an increase of power—either of new power or by extending applications of existing power. He had been told by experts that the aim of this country should be the establishment of a network of lines of electrical transmission across the heart and centre of industrial England drawing power from the various coalfields and distributing it, under the agency of local authorities, to industrial consumers. Of all communities in the world, the crowded population of these islands could least afford to fall behind in the lines of scientific development."

**Explosives in Mines.**—The Mines Department has the first report of the Explosives in Mines Research Committee (Safety in Mines Research Board paper No. 4; H.M. Stationery Office, price 3d.), which was appointed in September, 1922, by the Secretary for Mines, to carry out under the general direction of the Safety in Mines Research Board research into the causes of, and the means of preventing, the ignition of firedamp and coal dust by the firing of permitted explosives. The operations of the Committee have hitherto been mainly of a preliminary character and no positive conclusions have yet been reached, but the Board hopes that during the present year the Committee will be able to make substantial progress towards the solution of the important practical question—as distinct from the fundamental research—of an improved test for the admission of explosives to the "permitted" list, which the Board and the Mines Department had in view in its appointment.

**Empire Radio Communication.**—In giving his impressions to the *Morning Post* of the lessons learned by officers and men during the Empire cruise of the Empire Service Squadron, Vice-Admiral Sir Frederick Field is reported as having said that the supreme importance of radio telegraphy had been forced home on them by the fact that throughout the cruise the Squadron had had to depend almost entirely for Home and foreign news on that broadcast by foreign agencies. It seemed an anomaly, and one fraught with danger to the Empire, that the greatest maritime nation in the world should have to rely on foreigners for the dissemination of news to its ships on the high seas.

According to the daily Press, Mr. W. G. Gibson, Postmaster-General of Australia, who arrived in London on June 17th, will devote much attention to radio communication between Britain and Australia. He said the subject was brought before him in an extraordinary way during his voyage:—

"The news received on board for the first fifteen days all came from a German source and could be said to be of little interest to British people on board. From then onward a meagre sprinkling of news from an English station came through. With some 20,000 people at sea between the United Kingdom and Australia, surely some better service could be established?"

Mr. Gibson added that during his visit cable matters between Australia and Britain would be closely looked into.

**A Manchester Dinner.**—We are informed that a dinner and dance will be held at the Midland Hotel, Manchester, on Tuesday, October 21st, in aid of the Electrical Trades Benevolent Institution, which all sections of the trade are earnestly invited to support. Further details will be published at a later date, or can be obtained from Mr. F. G. Quance, Hon. Secretary, Manchester and District Advisory Committee, E.T.B.I., Magnet House, Victoria Bridge, Manchester.

**A Large Private Automatic Telephone Exchange.**—In a short article under this heading in our last issue we stated that the installation was the largest private automatic telephone exchange yet erected in this country. We should have qualified this statement by adding "of the 'Relay' type," for Messrs. Siemens Bros. & Co., Ltd., have written to us pointing out that they have erected four automatic exchanges which are larger than that at Britannic House. These were supplied to the Lucas Electrical Co., Ltd., Messrs. Cadbury Bros., Ltd., the Asiatic Petroleum Co., Ltd., and the Southern Railway.

**The Channel Tunnel.**—On June 26th, the Prime Minister, accompanied by ministers and representatives of the State departments concerned, received a deputation of members of the House of Commons Channel Tunnel Committee. Sir William Bull, Bart., the Chairman of the Committee, introduced the deputation and presented a memorandum prepared for the occasion dealing with the history of the movement, and containing the views of eminent authorities upon the subject. Sir William said that the Committee was supported by at least 400 Members of Parliament of all parties. The Rt. Hon. T. P. O'Connor, P.C., Mr. C. W. Bowerman, Mrs. Wintringham, Viscount Curzon, and Mr. Foot, all urged the importance of carrying out the work. Mr. Ramsay MacDonald, in the course of his reply, said that it was essential that the very best feelings should be maintained between France and this country, and in deciding this question the direct or indirect effects in promoting harmonious relations would have to be taken into account. The whole question would have to be considered from a practical and detailed point of view. He would treat the question as a matter of urgency and accordingly he had summoned a special meeting of the Committee of Imperial Defence for next week to consider and report upon the matter; he himself would occupy the chair. All the ex-Premiers had promised to attend that meeting, and the subject would be discussed independently of party politics by those who could speak with great authority on the proposed undertaking. Replying to a question as to the views of the French Government, the Premier said that any opinions so far expressed had been favourable, but non-committal. Finally, he said that he would see that the matter was not delayed, and the Government's decision would be made known to the House as soon as possible after the meeting.

Baron Emile d'Erlanger spoke of the commercial aspect of the scheme and predicted that excellent financial results were certain to be obtained. He said that the total expenditure was estimated at £29,000,000.

# Institution Notes.

**Institution of Electrical Engineers.**—NORTH-MIDLAND CENTRE.—Members of this Centre, of which the Hull City electrical engineer, Major H. Bell, is chairman, held their annual summer meeting at Hull recently, the party proceeding by motor-'bus, lent by the Hull Tramway Department, to the Humber Portland Cement Works of Messrs. G. & T. Earle, Ltd. (Wilmington), where the equipment is up-to-date, the whole of the machinery being driven electrically. There are, in all, about 70 motors of sizes varying from 500 to 5 h.p., the electricity being obtained from the Hull Corporation through a specially laid underground cable, one branch of which runs to the works and the other to the chalk quarry. The transmission distance is something over 12 miles and the pressure employed is 22,000 volts. The party returned to the Osborne Street sub-station of the Electricity Department to inspect the remote control of sub-station converting plant on the "Oxford" direct-current system, which has led the Corporation to adapt remote control to three-phase converting apparatus. On the return to the City Hotel the party had dinner.

NOMINATION OF OFFICERS.—The ballot papers for the election of the president, two vice-presidents, an hon. treasurer, and five ordinary members of Council have been issued. No other persons than those nominated by the Council have been nominated this year.

CONVERSAZIONE.—On Thursday last week, June 26th, the 100th anniversary of the birth of Lord Kelvin, the Institution held its annual conversazione at the Natural History Museum, South Kensington. The guests were received by Dr. A. Russell, M.A., F.R.S., president, and Mrs. Russell, and members of the Council. The string band of the Royal Engineers, under Lieut. Neville Flux, F.R.A.M., performed a lengthy programme of music in the central hall, and a concert was given in the Reptile Gallery. It was anticipated that there would be an exceptionally large attendance, but it appeared that the number present was less than usual.

**Physical Society of London.**—CAMBRIDGE MEETING.—A special meeting of the Society will be held in Cambridge, by the invitation of Sir Ernest Rutherford, on July 19th. During the morning Fellows have been invited by the Cambridge Instrument Co. to visit its works, and afterwards to luncheon. A scientific meeting will be held in the Cavendish Laboratory during the afternoon.

**Radio Society of Great Britain.**—An informal meeting of the Society will be held at the Institution of Electrical Engineers on July 9th, at 6 p.m., when Mr. P. R. Coursey, B.Sc., F.Inst.P., will talk on the manufacture of condensers, with the aid of lantern slides.

# Our Personal Column.

***The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the* ELECTRICAL REVIEW *posted as to their movements.***

The Birkenhead Tramways Committee has recommended the Town Council to increase the salary of the tramway manager, Mr. C. CLARKE, from £650 to £750 per annum.

Mr. ARTHUR CHARLES has resigned his position as managing director of Burnley Components, Ltd., Burnley.

A further effort at the Dundalk Urban Council Electricity committee to reduce the salary of Mr. P. A. SPALDING, manager of the electricity undertaking, in the interests of economy, was defeated. Reference was made to a report by Mr. Spalding sent to the Newry Urban Council on electricity matters in that town, and the manager explained that his original appointment was not subject to any conditions of a special character, and that he had had permission practically from the start to take up outside consulting work.

Barking Urban Council has increased the salary of the electrical engineer by £25 in respect of his basic salary, and £28 in respect of bonus, from July 1st.

Dover Town Council has decided to increase the salary of Mr. E. H. BOND, tramway manager, from £363 to £400 per annum.

Mr. E. C. DONALDSON RAWLINS, Commercial Secretary at Prague, will be in attendance at the office of the Department of Overseas Trade from July 7th to 14th for the purpose of interviewing, by appointment, British manufacturers and merchants interested in export trade to Czecho-Slovakia.

According to *The Times*, Mr. CHARLES JONES retired on Monday from the position of chief electrical engineer of the Metropolitan Railway, and Mr. P. R. BOULTON, of Birmingham, succeeded him as from that day. Mr. Jones will continue to act for the company in the capacity of consulting electrical engineer.

Mr. P. J. PYBUS, C.B.E., M.I.E.E., managing director of the English Electric Co., Ltd., has just returned to London from his third business trip to Canada since the war. He has been conferring with his colleagues in the English Elec-

tric Co. of Canada planning a campaign for extended operations. In addition to the need for agricultural workers, he perceived a need for really skilled workmen for industrial life and for more capital for the extension of commerce. Canada shows an ever-increasing desire to come closer to the Mother Country, and Britain, in Mr. Pybus's opinion, can do much to help in this connection by providing such labour and capital.

**Obituary.**—MR. E. PRIOR.—The death took place on June 22nd, after an operation, of Mr. Edward Prior, of Burgess Hill, Sussex. Mr. Prior, who was 47 years of age, went to Burgess Hill about 20 years ago to inaugurate the Burgess Hill and District Electric Light undertaking, and he became engineer and managing director of the company. He was also associated with the Sussex Electricity Supply Co., the Shoreham and District Electricity Supply Co., and the Haywards Heath and District Electricity Supply Co., and was engineer and managing director of all these concerns.

MR. F. W. BERK.—We regret to record the death of Mr. Frederick William Berk, which occurred at his residence at Bromley, Kent, on June 23rd, at the age of 78 years. Mr. Berk was the founder in 1870 of the business of Messrs. F. W. Berk & Co., Ltd., acid and chemical manufacturers, of Fenchurch Avenue, and Stratford, E., also of Morriston, near Swansea. Mr. Berk was at the time of his death chairman of the company, the other directors being Messrs. P. F. and A. D. Berk, and Mr. J. Kershaw. We are informed that the policy of the company will not be affected by the death of its founder.

MR. J. P. ACHURCH.—The death took place on Friday last, at his residence at Edgbaston, Birmingham, of Mr. John Philip Achurch, senior managing director of Parker, Winder and Achurch, Ltd., electrical supplies and hardware merchants, Broad Street, Birmingham. One of his sons has been for some years joint managing director of Parker, Winder & Achurch.

## New Companies Registered.

**Ewart Lawson, Ltd.** (198,780).—Private company. Registered June 23rd. Capital, £1,000 in £1 shares. To take over the business of a wireless dealer carried on by E. Lawson at Imperial Buildings, Peel Square, Barnsley, as "Ewart Lawson, wireless specialist," and to carry on the same and the business of motor engineers, cycle, photographic and general hardware dealers, &c. The permanent directors are:—E. Lawson, Beevor Lodge, Pontefract Road, Barnsley, wireless specialist; T. E. Leary, Highfield, Doncaster Road, Darfield, near Barnsley, wireless engineer. Qualification, £100. Registered office: Imperial Buildings, Peel Square, Barnsley.

**A. Behm (London), Ltd.** (198,795).—Private company. Registered June 23rd. Capital, £5,000 in £1 shares. To acquire the business of a wireless engineer and accessory manufacturer now carried on by A. Behm at 15, Cromer Street, Gray's Inn Road, W.C.2. The first directors are:—A. Behm, 42, Causton Road, Highgate, N.6; W. C. Lovegrove, 77, Underhill Road, East Dulwich, S.E.22; H. A. A. Brosse, 120, Cranley Gardens, N.10. Qualification (except original directors), 5 shares. Solicitors: Finch, Turner and Tayler, 84, Cannon Street, E.C.4. Registered office: 15, Cromer Street, King's Cross, W.C.1.

**Houghton's Electrical Engineering Co., Ltd.** (198,693).—Private company. Registered June 18th. Capital, £1,500 in £1 shares. To adopt an agreement with M. M. Houghton and M. R. King to develop and turn to account the business of general engineers carried on at 11, The Garages, Turnham Green Terrace, Chiswick, as "Houghton's Electrical Engineering Co.," and to carry on the business of manufacturers of and dealers in wireless apparatus, electrical, mechanical and hydraulic engineers and contractors, electricians, &c. The permanent directors are:—M. M. Houghton, 40, Shaftesbury Road, Ravenscourt Park, W.6, engineer; M. R. King, 11, Egmont Road, Sutton, Surrey, engineer. Qualification of permanent directors, 500 shares. Solicitors: Hutchison & Cuff, 6, Stone Buildings, Lincoln's Inn, W.C.2.

**Beresford Brothers, Ltd.** (198,836).—Private company. Registered June 25th. Capital, £10,000 in £1 shares. To take over the business of dealers in hair and other brushes and hairdressers' sundries, leather purses, bags, trunks, and cases of all kinds, and fancy goods, electrical and mechanical engineers, manufacturers of electrical, wireless and other apparatus, &c., carried on by H. Beresford and A. Mason at 2, Bull Street and 108, Dale End, Birmingham, as Beresford Brothers, together with the assets and any properties occupied or held in connection herewith, including cash in hand and at bankers, and book and other debts. The permanent directors are:—H. Beresford, "Drayton," Goldieslie Road, Wylde Green, Warwickshire, electrical engineer; A. Mason, Kingswood Lodge, Victoria Road, Acocks Green, Birmingham, electrical engineer; J. H. A. Beresford, "Drayton," Goldieslie Road, Wylde Green, Warwickshire, electrical engineer. Qualification, £50. Remuneration (except managing directors) as fixed by the company. Secretary: A. Mason. Solicitors: Shorthouse, Bowen & Co., 153a, Corporation Street, Birmingham. Registered office: 108, Dale End, Birmingham.

## Official Returns of Electrical Companies.

**Franco-British Electrical Co., Ltd.**—Particulars filed of £6,000 debentures authorised June 18th, 1924, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

**Mersey Power Co., Ltd.**—Particulars filed of £296,475 4s. 10d. debentures authorised February 27th, 1924, charged on the company's undertaking and property, present and future, including uncalled capital, subject to a first charge in favour of the Minister of Munitions to secure £300,000, the whole amount being now issued.

**Lithanode Co., Ltd.**—Issue on May 1st, 1924, of £250 debentures, part of a series already registered.

**English Electric Co., Ltd.**—Satisfaction to the extent of £23,400 on October 18th, 1923, of first mortgage debentures, covered by trust deed dated September 15th, 1919, securing £1,000,000. (Filed June 20th, 1924.)

**Helix Heater Co., Ltd.**—Satisfaction in full on June 12th, 1924, of mortgage debenture dated August 25th, 1923, securing £300.

**A. E. Acton-Burnell, Ltd.**—R. Palba, of 73, Basinghall Street, E.C., was appointed receiver on June 16th, 1924, under powers contained in debentures dated July 31st, 1923.

**Accumulator Charging Co., Ltd.**—P. Stromeyer, of 208, West End Lane, N.W.6, was appointed receiver and manager on June 18th under powers contained in debenture dated April 16th, 1924.

**Boulton Magnets, Ltd.**—J. E. Jordan, of 79, Lichfield Street, Wolverhampton, ceased to act as receiver or manager on June 18th, 1924.

**Paignton Electric Light & Power Co., Ltd.** (98,437).—Return dated March 25th, 1924. Capital, £40,000 in £1 shares. 35,000 shares taken up. £35,000 paid. Mortgages and charges, nil.
Return of allotments, made up to April 14th, 1924, shows a further 5,000 shares allotted, payable in cash.

**W. T. Glover & Co., Ltd.** (56,124).—Return dated May 13th, 1924. Capital, £214,850 in 100,000 preference and 114,850 ordinary shares of £1 each. All shares taken up. £117,000 paid on 67,000 preference and 50,000 ordinary shares. £97,850 considered as paid on the remainder. Mortgages and charges, nil.

**Charing Cross Electricity Supply Co., Ltd.** (29,122).—Return dated March 18th, 1924. Capital, £2,100,000 in 400,000 preference, 900,000 ordinary, 400,000 City Undertaking preference, and 400,000 City Undertaking ordinary shares of £1 each. 400,000 preference 576,000 ordinary, 400,000 City Undertaking preference, and 350,000 City Undertaking ordinary shares taken up. £1,280,000 paid on 400,000 preference, 480,000 ordinary, and 400,000 City Undertaking preference shares. £446,000 considered as paid on 96,000 ordinary and 350,000 City Undertaking ordinary shares. Mortgages and charges, £1,336,178.

**Reed, Evans & Co., Ltd.** (72,015) (formerly Railway Finance & Construction Co., Ltd.).—Return dated December 31st, 1923 (filed April 11th, 1924). Capital, £100,000 in £1 shares. 92,292 shares taken up. £1 per share called up on 657 and 4s. per share on 29,595 shares. £6,576 paid. £85,716 considered as paid, being £1 per share on 62,040 and 18s. per share on 29,595 shares. Mortgages and charges, nil.

**Telegraph Construction and Maintenance Co., Ltd.** (1,147C).—Return dated March 27th, 1924. Capital, £896,400 in £12 shares. All shares taken up. £448,200 paid. £448,200 considered as paid. Mortgages and charges, nil.

**Mather & Co., Ltd.** (74,002).—Return dated November 8th, 1923 (filed March 14th, 1924). Capital, £20,000 in £1 shares. 11,039 shares taken up. £9,539 paid. £1,500 considered as paid. Mortgages and charges, nil.

**H. T. Boothroyd, Ltd.** (99,742).—Return dated December 31st, 1923 (filed May 22nd, 1924). Capital, £20,000 in 15,000 ordinary and 5,000 preference shares of £1 each. 10,002 ordinary and 2,800 preference shares taken up. £2,802 paid. £10,000 considered as paid. Mortgages and charges, £5,125 19s. 10d.

**James Keith and Blackman Co., Ltd.**—Satisfaction in full on June 7th, 1924, of debenture dated May 30th, 1923, securing £650.

## City Notes.

**Eastern Telegraph Co., Ltd.**

Sir John Denison-Pender, G.B.E., presided at the annual meeting on June 24th, and in presenting the report and accounts, which were abstracted in our issue of June 20th, (p. 1017), said that the company had recently lost two directors—Sir Albert J. Leppoc Cappel and Viscount Pirrie, and their death robbed the company of two sage advisers. Although the year's profit was £41,000 less, the position, having regard to the circumstances, was not unfavourable. The decrease in revenue might be attributed partly to the re-opening of the Indo-European Telegraph Co.'s overland route to India, and partly to the widespread depression. Working expenses had been reduced in practically every item. The £300,000 which had been placed to the general reserve had been used in respect of expenditure on new cables, &c., held in suspense. There still remained about £1,350,000 to be dealt with in future years. In conjunction with the Eastern Extension Co. they had spent 5¼ millions since the termination of the war, on account of a new line of cables to the East and on important renewals; of this sum they had only applied to the stockholders for £1,000,000. The cable ships *Electra* and *Britannia* had been placed out of commission, and the oil-fuelled *Mirror* was put into service during the year. The transmission time was back to the pre-war standard, and in many cases it had improved. The chairman then referred to the dispute with Turkey. The company held a sum of over £100,000 due for terminal rates at Smyrna during the hostilities between Turkey and Greece. The amount was claimed by both parties, who refused to submit the matter to arbitration. As a result the company had ceased operations in Turkey. Although this was greatly to be regretted, it would have no material effect upon the company's revenue. The company had opened negotiations with France for obtaining a special wire between Paris and London in connection with South American traffic, but the application had been refused. It was felt very strongly that as special wires were allocated to the French company competing in this country for South American traffic by the British Post Office, corresponding facilities should be granted to a British company in France. Direct communication was established between Emden and London during the year.

The confidence of the staff in the company was shown by their retention of practically all the £70,000 stock allotted to them at par.

Turning to the technical side, the Chairman said that in the course of the year the Associated Companies had acquired the patent rights of an invention by which two messages could be sent one way and one message sent in the opposite direction simultaneously on one wire. This was actually working on one of the company's Gibraltar-Malta cables. The Post Office leased the company seven underground wires between London and Cornwall at an annual rent of over £17,000. Intimation had been received that extra rent would be charged if the invention referred to was used on these lines, but the company was negotiating with the G.P.O. on the subject and a satisfactory settlement was hoped for. The company had to meet the competition of radio-telegraphy between England and Egypt, between France and Indo-China and Madagascar, and between Holland and the Dutch East Indies. Although in some cases the radio rates were lower, the company had not found it necessary to reduce its charges. Although "wireless" had demonstrated its practical value in many ways, the submarine cable was still the most reliable, swift, and secret method of international communication.

In reply to a question, the Chairman said that Turkey had collected £19,000 from telegraph traffic which was due to the company. The report and accounts were adopted.

**Kalgoorlie Electric Power and Lighting Corporation, Ltd.**

The annual meeting was held on June 23rd, Mr. G. C. Howard presiding. In moving the adoption of the report and accounts (*vide* ELEC. REV., June 20th, p. 1017), the Chairman referred to the intention of Mr. C. Ogle, one of the joint trustees for the income debenture holders, to move the adjournment of the meeting, in view of an application which had been made to the Court for a ruling upon the question of the amount of depreciation which the directors were permitted to charge in the accounts. He (the chairman) proposed, however, to make a general statement first. The profit for the year would have been higher had it not been for a strike which had caused the closing of the mines in the district for a period of nearly a fortnight. Kalgoorlie had been for some time a declining goldfield, as most of the rich ore had been worked out. The length of its life depended upon the lowering of production costs. The company's present plant was inadequate and arrangements had been made to install a 1,000-kW Belliss & Morcom turbo-generator set; this should be in operation before the end of the current year. Referring to the amount of depreciation which had been written off, Mr. Howard said that the directors could not agree with Mr. Ogle that it was too high. Mr. Ogle's action was not in the best interest of the income debenture holders. Dr. Gerald T. Moody, in seconding the adoption of the report and accounts, asked what authority Mr. Ogle had for his application to the Court. His co-trustee and many large holders of the stock were not in agreement with him. Continuing, he said that the value of the undertaking was only in its being a going concern. The buildings and machinery would be useless if the mines closed down. Mr. Ogle then rose. He said that he had asked for certain information to enable him to ascertain if the amount written off for depreciation was reasonable. He was informed that it was impossible for the required information to be supplied. Acting upon legal advice, application had been made to the Court for its opinion on the matter. Pending the hearing of the application he begged to move the adjournment of the meeting. Several speakers participated in a subsequent discussion, the outcome of which was that the motion for the adjournment was lost and the report and accounts adopted with only two dissentients. A motion expressing confidence in the directors and censuring Mr. Ogle was then carried and the proceedings terminated.

**Eastern Extension, Australasia and China Telegraph Co., Ltd.**

Sir John Denison-Pender, G.B.E., presided at the annual meeting on June 26th, and in the course of his speech said that the decrease in revenue was not so great as was anticipated, while the working expenses had been reduced considerably. The accounts (see ELEC. REV., June 20th, p. 1016) were therefore satisfactory. The Chairman pointed out that although, since 1913, 7,200 miles of new cable had been laid at a cost of £2,158,370, and new offices and staff quarters had been acquired at an expenditure of £528,387, the capital had only been augmented by £1,000,000, the balance having been met from revenue. After forty years of service the cable steamer *Recorder* was to be replaced by an oil-fuelled vessel now being built at Glasgow. The cost of this would be defrayed from the £100,000 which had been set aside as the "maintenance ships' reserve fund." The vessel was expected to leave for Singapore towards the end of the year. The reduction of £33,863 in the expenditure upon partial duplication and renewals of cables indicated that the arrears of that work had been practically cleared off. Interruptions during the past year had been few and caused no delay in the transmission of traffic. The Hong-Kong—Haiphong cable had been abandoned on account of the costliness of its maintenance. There were still three channels of communication between Singapore and Hong Kong. Only seven more miles at the shore end of the Singapore-Batavia section duplication remained to be completed; landing rights were still being awaited from the Netherlands Indian Government. Difficulty had arisen in connection with the payments due to that Government by the German Nederlando Telegraph Company, which the Government was claiming from the Eastern Extension Company; a conference was being arranged and an early settlement was hoped for. No improvement had taken place in Chinese affairs and China's monetary obligations to the company and to the Great Northern Telegraph Company had fallen into arrears. The support of the Foreign Office had been enlisted in this matter, but no definite conclusion had been arrived at. The Eastern Associated Telegraph Companies had participated in the Guarantee Fund of the British Empire Exhibition to the extent of £5,000. A shareholder asked for information regarding the company's application for a wireless licence in India. The chairman said that a licence with regard to Great Britain had been applied for, but the Government had not yet declared its policy in the matter. As to India the company had received the terms for a licence but it was impossible to carry them out. With regard to China there had been negotiations with a British wireless company. The latter stipulated for higher rates for cable messages than for wireless traffic. The company would certainly not agree to this without safeguards and negotiations had fallen through. The report and accounts were adopted.

**Globe Telegraph and Trust Co., Ltd.**

Speaking at the annual meeting on June 24th, Sir John Denison-Pender, G.B.E. (Chairman), said that the accounts (*vide* ELEC. REV., June 20th, p. 1017), disclosed a satisfactory position. Although the gross receipts had decreased, the net income (including the amount brought forward) was £381,194, as against £363,179 in 1922. The revenue from the Mackay Companies was smaller, as in the previous year a bonus of 10 per cent. had been paid, and that from the Submarine Cables Trust was reduced owing to the drawing of bonds for repayment. On the other hand receipts from investments and interest on deposits had increased. The money obtained from the sale of Anglo-American stock and from the Submarine Cables Trust had been invested in shares of the Direct Spanish Telegraph Co. and the Great Northern Telegraph Co. Money received from the Direct United States Co. had been invested in 5 per cent. National War Bonds. They had again been able to place a considerable sum to the reserve which amounted to £90,000. The present market value of securities held by the company showed a surplus over the original cost of £1,858,571. A shareholder asked if the directors would not consider the advisability of obtaining powers to enable them to make investments other than in submarine cables, but the Chairman said that they hesitated to alter the constitution of the company and enter markets in which there was considerable competition.

**General Electric Co., Ltd.**

The directors report that the net profits for the year ended March 31st, 1924, were £835,561, plus £174,121 brought forward, giving a total of £1,009,682. After deducting debenture stock interest, £241,241; depreciation, £184,044; contribution to pension fund, £14,346; 6½ per cent. dividend on "A" preference shares for the year, £117,000; and 7½ per cent. dividend on "B" preference shares for the year, £135,000, there remains an available balance of £318,051. A dividend at the rate of 5 per cent. per annum on the ordinary share capital for the year requires £105,599, leaving to be carried forward subject to corporation profits tax for the year £212,452. "The results for the year indicate further satisfactory progress. The net trading profits of £835,561 show an increase of £84,075 over the previous year. This improvement is gratifying, although it falls short of what might justly be expected from the efforts made. The demand for general electrical commodities has steadily expanded, but the returns in heavy engineering have still been disappointing. This department has suffered from low ruling prices, an irregular flow of incoming orders particularly on the mechanical side, and an insufficient demand for standard products. The export business has not yet regained its normal vitality, though signs of recovery are becoming apparent."

The liquid resources amounted at the close of the year to some £618,000. The reduction as compared with last year is due to an increase of £180,000 in "sundry debtors" and over £120,000 in "stock-in-trade and work in progress," reflecting the increased volume of general business. The award given since March 31st by the Mixed Arbitral Tribunal of approximately £300,000 will increase the liquid assets to that extent, but this item has not in any way been considered in the present balance-sheet. The greater activity in the company's business is responsible for an increase of over 2,000 in the number of its employés, which now exceeds 17,000. Meeting: London, July 8th.

**Delhi Electric Tramways and Lighting Co., Ltd.**

The report for the year 1923 shows that the gross receipts were:—Tramway undertaking, £23,844; electricity supply undertaking, £62,743; total, £86,587. The combined undertakings show a net revenue of £36,840, as compared with £30,783 in 1922. The profit, after charging general expenditure and debenture interest, was £33,813; to this is added £292 brought forward, making £34,105. The following appropriations have been made:—Depreciation of plant and equipment, £12,500; reserve for British and Indian taxation, £4,000; and renewals reserve account, £3,561. It is proposed to deal with the balance as follows:—Dividend of 10 per cent. on the preferred and participating shares, £10,000; and 9.448 per cent. on the ordinary shares; leaving £1,304 to be carried forward. Additions costing £30,569 have been made to the plant during the

year, consisting of further Diesel plant, switchgear, mains, and cooling plant, and the necessary extensions of buildings. The sum of £12,500 has been provided for depreciation. The meeting was held on Wednesday last.

**Edmundsons' Electricity Corporation, Ltd.**

The report of the directors for 1923, which is to be submitted at the annual meeting on Wednesday next (July 9th), records a net profit of £58,360, after providing for income tax and debenture stock charges. A balance of £22,815 is brought forward, making £81,175. After the payment of preference dividends and an interim dividend on the ordinary shares, and a recommended final dividend on the latter of 4 per cent. (making 7 per cent. for the year), it is proposed to place £20,000 to reserve and to carry forward £16,375. With the payment of a final dividend of 4 per cent. (making 7 per cent. for the year), the non-cumulative preference shares will be consolidated into one class with the cumulative preference shares. The directors have under consideration a scheme for capitalising part of the undistributed profits to replace the amount of £2 per share written off the ordinary shares in 1912, and for sub-dividing all classes of shares into £1 shares.

**Folkestone Electricity Supply Co., Ltd.**

An extraordinary general meeting is being held to-day (Friday) for the purpose of considering and, if thought fit, approving an increase in the company's capital, &c. It is proposed to create 50,000 ordinary £1 shares to rank for dividend and in all other respects *pari passu* with the existing ordinary shares. This will increase the company's capital to £150,000. At the same time the splitting of the £5 ordinary and preference shares into five shares of £1 each is to be put forward. The new shares will be allotted at par, if desired, to present shareholders in proportion to their holdings. The proceeds will be utilised to defray the cost of extensions which are nearing completion, and to provide liquid reserves for future requirements.

**Barcelona Traction, Light and Power Co., Ltd.**

A meeting of the first mortgage bondholders was held on June 25th under the chairmanship of Mr. E. R. Peacock. The chairman briefly sketched the history of the company, making special reference to the amount which had been set aside from the earnings to provide for developments, and then explained the proposals which the meeting had been called to consider. These were approved unanimously, and they also received the assent of a subsequent meeting of income bondholders. The issue of new bonds to the extent of £2,800,000 was made the following day (see under "Prospectuses").

**Belgian Company.**

*La Société des Forges et Ateliers de Constructions Electriques*, of Jeumont, which has a capital of 80 million francs, in addition to 43,000 founders' shares of no nominal value, reports a net profit of 11,099,603 fr. for the last financial year. The dividend is to be 10 per cent. The company holds a large interest in the Société des Ateliers de Constructions Electriques de Charleroi, the Société Electricité et Gas du Nord, the Union Européene Industrielle et Financière, and other undertakings, all of which were successful last year. The Jeumont Company also had a busy year and it commenced the current financial period with orders in hand representing a value of over 100 million francs, or more than one million sterling at the current rate of exchange.

**Prospectuses.**

*British Insulated & Helsby Cables, Ltd.*—The list closed on Saturday last of subscriptions to an issue at 98 per cent. of £700,000 5 per cent. mortgage debenture stock by this company. The proceeds are to be utilised to pay off the 4½ and 5 per cent. mortgage debenture stock amounting to £700,000, which matures on January 1st, 1925. The new stock will rank as a first mortgage after that date; it is redeemable on or before January 1st, 1950, at 103 per cent.

*Barcelona Traction, Light & Power Co., Ltd.*—This company made an issue of £2,800,000 consolidated 6½ per cent. prior lien bonds on June 26th at 91 per cent. of the nominal price. These are part of an authorised issue of £5,000,000, and are redeemable on or before June 1st, 1965, by means of a sinking fund. The proceeds are to be employed as follows:—In paying off, at 106 per cent., the outstanding 8 per cent. secured debentures; in paying the purchase price of the prior lien "A" bonds, to reduce the amount to £1,100,000; in or towards payment of the amount due in cash to such holders of 5½ per cent. first mortgage bonds, as accept the offer which the company proposes to make for the surrender of their holdings for cash and preference shares at the rate of $300 par value of shares and £20 cash for each £100 first mortgage bonds; and any balance will be used for the general purposes of the company. If more cash is required it will be provided by the issue of sufficient consolidated 6½ per cent. prior lien bonds.

*Shropshire, Worcestershire, & Staffordshire Electric Power Co.*—Allotment letters and letters of regret in respect of the recent issue of £650,000 5½ per cent. first debenture stock were posted on June 27th. A large proportion of the holders of the company's existing debenture stocks exercised their rights of conversion into the new issue, and the cash applications exceeded the amount available for allotment by about £5,000,000.

*West Gloucestershire Power Co., Ltd.*—The list was opened on Monday in an issue of £300,000 5½ per cent. first mortgage sinking fund debenture stock at £97 10s. per cent. and 300,000 6½ per cent. participating preference shares of £1 each at £1 0s. 6d. per share. Particulars are given in the prospectus of the company's undertaking, its new works, and contracts. Payment for the construction of the station, works, and transmission lines, and for certain other expenses and outgoings consequent upon the formation of the company, interest during construction, legal and other fees, &c., and other expenditure for the initial construction has been provided by the issue to the contractors of 234,000 fully-paid ordinary shares of £1 each and £450,000 bills of exchange of the company payable on demand. The proceeds of the present issues will be applied in redeeming the bills of exchange, for the construction of low-pressure mains, the extension of high-pressure mains, and for the general purposes of the company.

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**Montreal Water and Power Co.**—The report for the year to April 30th, states that out of gross profit the following provisions have been made:—Yearly sinking fund for redemption of bond issues, proportion of discount and expenses of bond issues, bad debts, reserve for damage claims, and the general depreciation fund has been increased by about $164,000. Following this the net profits show a balance of about $198,000, which the directors regard as fairly satisfactory. The company has paid dividends on its outstanding stock issues, and carried forward a substantial amount, subject to taxation.—*Financial News.*

**Stock Exchange Notices.**—Dealings in the following securities have been specially allowed by the Committee under Rule 159:—

Barcelona Traction, Light and Power.—£2,800,000 consolidated six and a-half per cent. prior lien bonds, issued at 91 per cent., partly and fully paid.

Stewarts and Lloyds.—33,058 deferred shares of £1 each, fully paid, Nos. 2,638,101 to 2,671,158.

Whitehall Electric Investments.—£1,000,000 new six per cent. first mortgage debenture stock, issued at 94 per cent., partly paid and fully paid; and 1,000,000 new seven and a-half per cent. cumulative preference shares of £1 each, partly paid and fully paid, Nos. 6,500,001 to 7,500,000.

Application has been made to the Committee to allow the following to be officially quoted:—

South Wales Power Co.—£600,000 first mortgage debenture stock.

**New General Traction Co., Ltd.**—The profit for the year ended March 31st last was £8,800, as against £5,864 in 1922-23. The total available (including £2,267 brought forward) is £11,067, and a dividend of 4 per cent., less tax, is recommended, leaving £2,945 to be carried forward. Meeting to-day (Friday).

**Syria.**—The report of the *Société des Tramways et Eclairage de Damas* for last year shows a net profit of 932,130 francs, as compared with 933,359 francs in 1922. A new agreement has been arranged between the company and the Syrian Government authorities based on the altered post-war conditions.

**Chloride Electrical Storage Co., Ltd.**—In addition to the payment of dividends amounting to 20 per cent., free of tax, for 1923, the company is transferring £50,000 to reserve, contributing £6,000 to the employés' benefit fund, and carrying forward £44,888.

**La Plata Electric Tramways Co., Ltd.**—The net profit for 1923 amounted to £13,891, and the total available to £20,864. Of this amount £10,000 is to be placed to reserve; £2,970 written off preliminary expenses; and £2,484 off expenses of debenture stock issue, leaving £5,410 to be carried forward.

**Chili Telephone Co., Ltd.**—A final dividend of 3s. per share, free of tax, is recommended, making 6s. (6 per cent.), free of tax, for the year 1923-24, as in the five preceding years.

**Aron Electricity Meter, Ltd.**—The payment of arrears on the 6 per cent. cumulative preference shares is to be brought up to March 31st, 1923, by the distribution of a further 12 per cent.

**St. James' & Pall Mall Electric Light Co., Ltd.**—Interim dividends at the rate of 3s. 6d. per share on preference, and 5s. per share on ordinary shares. Payable August 2nd.

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# Stocks and Shares.

MONDAY EVENING.

THE outstanding feature in the lists with which we deal this week is the recovery in cable stocks and shares. After the shake-out which occurred three weeks ago in consequence of the nervousness then engendered by the latest wireless wonders, the speech of the Chairman at the Eastern Telegraph meeting (to which reference was made here last week) came as a wholesome tonic, and had the effect of reviving shareholders' confidence and of sending buyers into the market. The small amount of floating supply of stock was quickly absorbed, and prices are now mounting again. Eastern ordinary shows a gain on the week of 3 points. Eastern Extensions, Globes and Westerns are all better. The market may again be described as normally firm.

Meanwhile, the shares in the wireless group continue dull. This is due to the fear that the Marconi dividend of 15 per cent. cannot be maintained, a fear which is fed by the continued uncertainty with regard to the final settlement with the Government. Until some agreement is reached, as we have so often said before, it is impossible to expect that the Marconi Company will be able to get into its own proper stride, and to devote all its energies to the work which lies ahead of it. It must be confessed that the Marconi shareholders' patience has been severely tested. The board will no doubt maintain, and justly, that it has been unable to supply their fellow proprietors with a great deal of information, but he, that shareholder, may be tempted to think at times that more information might be accorded him with regard to the progress which his company is making. Everyone is agreed that wireless has a wonderful future, in the working towards which, however, the shareholders are certainly being called upon to exercise a large measure of faith. Submarine Cables Trust gained several points at 223.

The result of the recent issue of debenture stock and preference shares in the Whitehall Electric Investments, Ltd., was to release underwriters of the debenture stock from any liability. With regard to the preference shares, however, an unpleasant surprise awaited the underwriters last Friday, in that they found themselves asked to take up 80 per cent. of their contract. The underwriters, it may be said, were called upon to take the mixture, as the Stock Exchange says, the debenture stock and preferences being underwritten jointly. On the announcement of the figures, the preference shares fell to 1s. discount, and as the underwriters received 6d. per share commission, the sale of these shares at the opening price would have left them with a loss, balanced partly, however, by the commission which they will secure on the debenture. The price of the latter, issued at 94, is ½ discount to "par," suggestive of stag operations. Meanwhile the price of the existing preferences has eased off to 20s. 6d., and the old debenture is quoted at 95.

In the case of the Barcelona Traction 6½ per cent. issue, the public took only 11 per cent. of the total amount offered. The price started off at 2 discount, and fell away to 2½ discount. The British Insulated Company's 5 per cent. debenture will probably be well placed in spite of its rather high price of 98. New Shropshire, Worcestershire, and Staffordshire debenture commanded a premium of 2 points, but so many small allotments came to market that the price eased off a trifle. The stock is a sound investment, and worth keeping by those who received allotments. West Gloucestershire Power 5½ per cent. first mortgage debenture was offered this week at 97¼, to the extent of £300,000, an equal amount in 6½ per cent. participating preference shares of £1 each being issued, at the same time, at 20s. 6d.

Another rise in County of London Electric Supply shares has lifted the price to 49s. 6d., which makes it stand at almost the highest price, relatively speaking, in the list. Rumour, purely conjectural at present, hints at the possibility of some new issue from the company at a price that will provide the shareholders with a bonus. Those who subscribed to the last new offer of ordinary shares at 22s. 6d. now see their money more than doubled, and, in view of the wide scope that exists for expansion of the County company's operations, it is obvious that, sooner or later, shareholders will be invited to put up more money. The list of electricity supply shares as a whole is steady, without any especial feature. Edmundsons at 5 are unchanged upon the proposal to reinstate the £2 previously written off the ordinary shares.

Home Railway stocks show no disposition to improve. Amongst the Undergrounds, Districts are dull at 51 upon anticipation that the interim dividend to be declared shortly will fall below the 3 per cent. (1½ per cent. actual) announced a year ago. Speculation is rife as to how much the Underground income bonds will receive, Lord Ashfield's statements at the time of the recent Tube strike being quoted as a reason why caution should be exercised in estimating the probable distribution for the first half of this year. The price of the bonds is 2 lower at 91. Metropolitans are ½ down at 80 despite the assumption that the last year's 3 per cent. interim dividend (1½ per cent. actual) will be maintained. East London ordinary stock fell to 4¼, but recovered to 5. The pre-ordinary stocks continue to hold their prices, and, of the Trade Facilities issues, the only one in which there is any reasonable amount on offer is City & South London 4½ per cent. debenture, of which £25,000 can be secured at 95¼, paying £4 17s. 6d. per cent. on the money.

British Electric Traction is no less than 6 higher, and the preference stock 3½ up, of which movements the chairman's speech at the meeting is the main cause. Brazilian Tractions have shot up, publication of the report of the Montague Mission to Brazil leading to cheerfulness with regard to Brazilian descriptions of all kinds. Mexicans further receded, the preferred shares of the Light & Power Company being down. Delhi Electric Tramways shares at 22s. 6d. are 1/16 better on the week.

General Electric ordinary have rallied to 20s. 3d., and Siemens at 18s. 9d. are ex 6d. dividend. Electric Constructions at 30s. show a small decline. British Aluminium ordinary at 25s. are rather better. Engineering and allied shares remain steady, without special feature of interest. The rubber market arouses no attention.

# Share List of Electrical Companies.

### Home Electricity Companies.

| | Nom. £ | Dividend. 1922. | Dividend. 1923. | Price June 30, 1924. | Rise or fall. | Yield. p.c. |
|---|---|---|---|---|---|---|
| Brompton Ordinary ... ... | 1 | 12 | 10 | 37/- | — | *25 6 1 |
| Charing Cross Ordinary ... ... | 1 | 14 | 14½ | 42/- | — | 6 18 1 |
| do. do. do. 4½ Pref. | 1 | 4½ | 4½ | 17/- | — | 5 6 0 |
| Chelsea ... ... ... ... | 1 | 10 | 12 | 37/6 | — | 6 8 0 |
| City of London ... ... ... | 1 | 15 | 15 | 45/9 | — | 6 11 0 |
| do. do. 6 % Pref. ... | 1 | 6 | 6 | 23/6 | — | 5 2 1 |
| County of London ... ... ... | 1 | 10 | 15 | 49/6 | + ½ | 6 1 0 |
| do. do. 6 % Pref. ... | 1 | 6 | 6 | 1¼ | — | 5 6 8 |
| Edmundson's Ordinary ... ... | 5 | 7 | 7 | 5 | — | 4 4 1 |
| do. 6 % Pref. ... ... | 5 | 6 | 6 | 5¾ | — | 5 11 7 |
| Kensington Ordinary ... ... | 5 | 12 | 14 | 9½ | — | 7 3 7 |
| London Electric ... ... ... | 1 | 10 | 10 | 31/- | — | 6 9 0 |
| do. do. 6 % Pref. ... | 5 | 6 | 6 | 5¾ | — | 5 11 7 |
| Metropolitan ... ... ... | 1 | 8½ | 10 | 1¾ | — | 5 14 3 |
| do. 4½ % Pref. ... ... | 1 | 4½ | 4½ | 17/-xd | — | 5 6 0 |
| Newcastle-on-Tyne Ordinary ... | 1 | 2½ | 6 | 18/9 | — | 6 8 1 |
| do. 5 % Pref. ... | 1 | 5 | 5 | 17/- | — | 5 17 6 |
| do. 7 % Pref. ... | 1 | 7 | 7 | 24/- | — | 5 16 8 |
| Notting Hill 6 % Pref. ... ... | 10 | 6 | 6 | 9½ | — | 6 6 4 |
| North Met. Elec. 6 % Pref. ... | 1 | 6 | 6 | 21/6 | — | 5 12 0 |
| Urban Ordinary ... ... ... | 1 | — | 4 | 13/9 | +6d. | 4 8 1 |
| do 6 % Pref. ... | 1 | 5 | 6 | 1 | — | 6 0 0 |
| St. James' and Pall Mall ... | 5 | 14½ | 17½ | 13¾ | — | 6 10 10 |
| South London ... ... ... | 1 | 11 | 15 | 43/8 | — | 6 18 7 |
| South Metropolitan Pref. ... | 1 | 7 | 7 | 1¼ | — | 5 12 0 |
| Westminster Ordinary ... ... | 5 | 12 | 15 | 10½ | — | 7 6 4 |
| Whitehall Elec. Invst. 7½ % Pref. | 1 | 7½ | 7½ | 20/6 | —1/- | 7 6 4 |

### Home Rails.

| | | | | | | |
|---|---|---|---|---|---|---|
| Central London Ord. Assented Stock | 4 | 4 | 69½ | — | 5 16 10 |
| Metropolitan ... ... ... ,, | 2½ | 4 | 80 | — ½ | 5 0 0 |
| do. District ... ... ,, | 3 | 3½ | 51 | — ½ | 6 17 1 |
| Underground Electric Ordinary | 10 | Nil | Nil | 2½ | — | Nil. |
| do. do. "A" ... | 1 | Nil | Nil | 7/6 | — | Nil |
| do. do. Income Bonds | 5 | 6 | 91 | —2 | *6 11 10 |

### Telegraphs and Telephones.

| | | | | | | |
|---|---|---|---|---|---|---|
| Anglo-Am. Tel. Pref. ... ... | Stock | 6 | 6 | 109½ | — | 5 16 0 |
| do. Def. ... ... ... | ,, | 1½ | 1½ | 23½ | — ¼ | 6 6 4 |
| Chile Telephone ... ... ... | 5 | 6 | 6 | 6¾ | — | 4 9 0 |
| Cuba Sub. Ord. ... ... ... | 10 | 7 | 7 | 7 | — | 10 0 0 |
| Eastern Extension... ... ... | 10 | 10 | 10 | 16¾ | + ½ | 5 19 5 |
| Eastern Tel. Ord. ... ... ... | Stock | 10 | 10 | 167½ | +3 | 5 19 5 |
| Globe Tel. and T. Ord. ... ... | 10 | 10 | 10 | 17½xd | + ¾ | 5 14 3 |
| do. do. Pref. ... ... | 10 | 6 | 6 | 11¾xd | + ¼ | 5 7 10 |
| Great Northern Tel. ... ... | 10 | 24 | 22 | 27½ | — ½ | 8 0 |
| Indo-European ... ... ... | 25 | 7 | 7 | 33½ | — | *5 6 1 |
| Marconi ... ... ... ... | 1 | 15 | — | 1½ | — | 10 0 6 |
| Oriental Telephone Ord.... ... | 1 | 12 | 12 | 11¾ | — | *6 8 9 |
| United R. Plate Tel. ... ... | 5 | 8 | 8 | 6¾ | — | *5 18 4 |
| West India & Panama ... ... | 10 | Nil | Nil | 1/- | — | Nil |
| Western Telegraph ... ... | 10 | 10 | 10 | 16¾ | + ¼ | 5 19 |

### Home and Foreign Trams, &c.

| | | | | | | |
|---|---|---|---|---|---|---|
| Anglo-Arg. Trams First Pref. ... | 5 | 12½ | 5½ | 8¾xd | — | 8 11 6 |
| do. do. 2nd Pref. ... | 5 | 5½ | 6 | 2¼xd | + ¼ | 10 4 4 |
| do. do. 5% Deb. ... | Stock | 5 | 5 | 73½ | +1 | 6 18 0 |
| British Electric Traction Ord. ... | ,, | 5 | 6 | 93xd | +6 | 6 19 0 |
| do. do. 6% Pref. ... ,, | 6 | 6 | 103½ | +3½ | 5 16 0 |
| Brazil Traction ... ... ... | 100 | 4 | 4 | 59¾ | +2½ | 6 14 6 |
| Brit. Columbia Elec. Rly. Pcc. | Stock | 5 | 5 | 87½ | — | 5 14 3 |
| do. do. Preferred ,, | 5 | 96/- | 84¼xd | — | *5 13 6 |
| do. do. Deferred ,, | 8 | 127/- | 100¾xd | — | *6 8 6 |
| do. do. Deb. ,, | 4¼ | 4¼ | 81½ | — | 5 4 4 |
| Lond. & Sub. Trac. 5 % Pref. ... | 1 | 5 | 2½ | 7/- | — | 7 2 10 |
| London United Tram. Deb. ... | Stock | 4 | 4 | 47xd | — | 8 10 2 |
| Mexico Trams. 5% Bonds ... | — | Nil | 5 | 70½ | — | 7 1 10 |
| do 6% Bonds ... | — | Nil | Nil | 48½ | — | Nil |
| Mexican Light Common ... | 100 | Nil | Nil | 18 | — | Nil |
| do. Pref. ... ... | 100 | Nil | Nil | 44 | —2½ | Nil |
| do. 1st Bonds ... | — | 5 | 5 | 68½ | —2 | 7 17 6 |

### Manufacturing Companies.

| | | | | | | |
|---|---|---|---|---|---|---|
| Babcock & Wilcox... ... ... | 1 | 20 | 12 | 47/6 | — | *5 1 3 |
| British Aluminium Ord.... ... | 1 | 5 | 5 | 25/- | +6d. | 4 0 0 |
| British Insulated Ord. ... ... | 1 | 15 | 15 | 2¾ | — | 5 14 3 |
| Callenders ... ... ... ... | 1 | 15 | 15 | 2⅞ | — | 5 17 0 |
| do. 6½ Pref.... ... ... | 1 | 6½ | 6½ | 23/3xd | — | 5 11 10 |
| Crompton Ord. ... ... ... | 1 | 5 | — | ⅞ | — | 8 17 10 |
| Edison-Swan ... ... ... | 4/- | 7½ | — | 5/- | — | 6 0 0 |
| do. ,, 5% Deb. ... ... | Stock | 5 | 5 | 75¼xd | — | 6 13 5 |
| Electric Construction ... ... | 1 | 10 | 10 | 1½ | + ⅛ | 6 13 4 |
| English Electric ... ... ... | 1 | 8 | 5 | 16/9 | — | 5 19 5 |
| do. do. Pref. ... ... | 1 | 6 | 6 | 19/6 | — | 6 8 1 |
| Gen. Elec. Pref. ... ... ... | 1 | 6½ | 6½ | 23/- | — | 5 13 1 |
| do. Ord. ... ... ... | 1 | 5 | 5 | 20/3 | +6d. | 4 18 9 |
| Henley ... ... ... ... | 1 | 15 | 15 | 2½ | + ⅛ | 5 11 6 |
| do. 4½ Pref. ... ... ... | 5 | 4½ | 4½ | 4½ | + ¼ | 5 6 0 |
| India-Rubber ... ... ... | 1 | 10 | — | ½ | — | *7 5 0 |
| Met.-Vickers Pref.... ... ... | 2 | 8 | 8 | 2⅞ | — | 6 11 3 |
| Siemens Ord. ... ... ... | 1 | 5 | — | 18/9xd | — | 5 6 8 |
| Telegraph Con. ... ... ... | 12 | 20 | 20 | 24½ | + ½ | *4 17 7 |

* Dividends paid free of Income Tax.

# The Incorporated Municipal Electrical Association.

## Annual Convention at Chester.

*(Continued from page 1060.)*

On Friday morning, June 20th, after a Council meeting, the annual general meeting was held at the Town Hall. The officers were elected without opposition, Mr. W. C. P. Tapper (Stepney) being the new president and Mr. R. B. Mitchell, vice-president. The place of meeting next year was left for the Council to settle.

The honorary officers were re-elected, namely, Mr. A. C. Cramb (hon. secretary), Mr. H. Faraday Proctor (hon. treasurer), and Mr. P. M. Heath (hon. solicitor).

The result of the ballot for new members of Council was the election of the following:—

Large towns, engineers: Messrs. A. Nichols Moore, S. J. Watson, F. W. Purse, and J. K. Brydges.

Small towns, engineers: Mr. E. Calvert.

Committee-men: Dr. Dewar, Councillor A. J. Ward.

Mr. S. T. Allen (Wolverhampton) urged undertakings to participate in the E.D.A. show at the British Empire Exhibition, even now. He emphasised the fact that this was the biggest co-operative effort ever carried out in the electrical industry, and that all sides of the industry must benefit from it. Mr. Staniland referred to the scarcity of good jointers, and it was agreed that a sub-committee should confer with the cable makers with a view to setting up a system of training. Association premiums of £10 each were awarded to the authors of the technical papers, Messrs. Miles and Waite.

Councillor Sutcliffe (Burnley) moved a resolution protesting against the transfer of electricity generation from municipal hands to power companies by the Electricity Commissioners, and demanding provision for appeal against the decisions of the Commissioners. Councillor Johnson (Southend) supported the resolution, but Ald. E. Huntsman (Nottingham) pointed out that the power companies possessed statutory powers which the Electricity Commissioners could not over-ride, and said the latter were doing their best in the national interest. They should try to get a new Act passed, to remove the obstacles that impeded the progress of electricity supply. The resolution was carried.

A special meeting was held to consider proposed changes in the articles of association, which were adopted after a long discussion.

Votes of thanks were accorded to the Mayor and Mayoress of Chester, the Electricity Committee and its chairman, E.L.M.A. and E.D.A., and the firms which took part in the exhibitions, &c., and to the honorary officers, especially the president; thanks were also cordially awarded to the secretary, Miss Lanfear, and her staff, who had successfully coped with an attendance which had unexpectedly increased by nearly 50 per cent. over the previous record. Certainly the manner in which Miss Lanfear carried out the preliminary arrangements and conducted the affairs of the Association throughout the Convention was beyond praise, and the notable success of the event was largely due to her foresight, tact, and discretion.

For the afternoon of Friday the arrangements included a visit to Messrs. Lever Bros.' Soap Works, Port Sunlight, a trip to Llangollen, and the I.M.E.A. competition at Chester Golf Club. In the evening there was a social and dance at the Grosvenor Hotel.

The programme for Saturday was restricted to a visit to the hydro-electric power station at Dee Bridge and a tour of the rural districts near Chester, to inspect the overhead lines and outdoor sub-stations employed for the distribution of electricity in these sparsely populated areas at 6,000, 3,000, and 230/400 volts.

*(To be concluded.)*

The Town Hall, Chester.

Starting on the River Trip.

At the Lodge Gates, Eaton Hall.

Arriving at Iron Bridge.

The Boat Race—one of the Heats.

The Boat Landing at Iron Bridge.

Meanwhile, the shares in the wireless group continue dull. This is due to the fear that the Marconi dividend of 15 per cent. cannot be maintained, a fear which is fed by the continued uncertainty with regard to the final settlement with the Government. Until some agreement is reached, as we have so often said before, it is impossible to expect that the Marconi Company will be able to get into its own proper stride, and to devote all its energies to the work which lies ahead of it. It must be confessed that the Marconi shareholders' patience has been severely tested. The board will no doubt maintain, and justly, that it has been unable to supply their fellow proprietors with a great deal of information, but he, that shareholder, may be tempted to think at times that more information might be accorded him with regard to the progress which his company is making. Everyone is agreed that wireless has a wonderful future, in the working towards which, however, the shareholders are certainly being called upon to exercise a large measure of faith. Submarine Cables Trust gained several points at 223.

The result of the recent issue of debenture stock and preference shares in the Whitehall Electric Investments, Ltd., was to release underwriters of the debenture stock from any liability. With regard to the preference shares, however, an unpleasant surprise awaited the underwriters last Friday, in that they found themselves asked to take up 80 per cent. of their contract. The underwriters, it may be said, were called upon to take the mixture, as the Stock Exchange says, the debenture stock and preferences being underwritten jointly. On the announcement of the figures, the preference shares fell to 1s. discount, and as the underwriters received 6d. per share commission, the sale of these shares at the opening price would have left them with a loss, balanced partly, however, by the commission which they will secure on the debenture. The price of the latter, issued at 94, is ½ discount to "par," suggestive of stag operations. Meanwhile the price of the existing preferences has eased off to 20s. 6d., and the old debenture is quoted at 95.

In the case of the Barcelona Traction 6½ per cent. issue, the public took only 11 per cent. of the total amount offered. The price started off at 2 discount, and fell away to 2½ discount. The British Insulated Company's 5 per cent. debenture will probably be well placed in spite of its rather high price of 98. New Shropshire, Worcestershire, and Staffordshire debenture commanded a premium of 2 points, but so many small allotments came to market that the price eased off a trifle. The stock is a sound investment, and worth keeping by those who received allotments. West Gloucestershire Power 5½ per cent. first mortgage debenture was offered this week at 97¼, to the extent of £300,000, an equal amount in 6½ per cent. participating preference shares of £1 each being issued, at the same time, at 20s. 6d.

Another rise in County of London Electric Supply shares has lifted the price to 49s. 6d., which makes it stand at almost the highest price, relatively speaking, in the list. Rumour, purely conjectural at present, hints at the possibility of some new issue from the company at a price that will provide the shareholders with a bonus. Those who subscribed to the last new offer of ordinary shares at 22s. 6d. now see their money more than doubled, and, in view of the wide scope that exists for expansion of the County company's operations, it is obvious that, sooner or later, shareholders will be invited to put up more money. The list of electricity supply shares as a whole is steady, without any especial feature. Edmundsons at 5 are unchanged upon the proposal to reinstate the £2 previously written off the ordinary shares.

Home Railway stocks show no disposition to improve. Amongst the Undergrounds, Districts are dull at 51 upon anticipation that the interim dividend to be declared shortly will fall below the 3 per cent. (1½ per cent. actual) announced a year ago. Speculation is rife as to how much the Underground income bonds will receive, Lord Ashfield's statements at the time of the recent Tube strike being quoted as a reason why caution should be exercised in estimating the probable distribution for the first half of this year. The price of the bonds is 2 lower at 91. Metropolitans are ½ down at 80 despite the assumption that the last year's 3 per cent. interim dividend (1½ per cent. actual) will be maintained. East London ordinary stock fell to 4¼, but recovered to 5. The pre-ordinary stocks continue to hold their prices, and, of the Trade Facilities issues, the only one in which there is any reasonable amount on offer is City & South London 4½ per cent. debenture, of which £25,000 can be secured at 95¼, paying £4 17s. 6d. per cent. on the money.

British Electric Traction is no less than 6 higher, and the preference stock 3½ up, of which movements the chairman's speech at the meeting is the main cause. Brazilian Tractions have shot up, publication of the report of the Montague Mission to Brazil leading to cheerfulness with regard to Brazilian descriptions of all kinds. Mexicans further receded, the preferred shares of the Light & Power Company being down. Delhi Electric Tramways shares at 22s. 6d. are 1/16 better on the week.

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# Share List of Electrical Companies.

### Home Electricity Companies.

| | Nom. £ | Dividend. 1922. | Dividend. 1923. | Price June 30, 1924. | Rise or fall. | Yield p.c. |
|---|---|---|---|---|---|---|
| Brompton Ordinary ... ... | 1 | 12 | 10 | 37/- | — | *£5 8 1 |
| Charing Cross Ordinary ... ... | 1 | 14 | 14½ | 42/- | — | 6 18 1 |
| do. do. do. 4½ Pref. | 1 | 4½ | 4½ | 17/- | — | 5 6 0 |
| Chelsea ... ... ... ... | 1 | 10 | 12 | 37/6 | — | 6 8 0 |
| City of London ... ... ... | 1 | 15 | 15 | 45/9 | — | 6 11 0 |
| do. do. 6 % Pref. ... | 1 | 6 | 6 | 23/6 | — | 5 2 1 |
| County of London ... ... ... | 1 | 10 | 15 | 49/6 | + ½ | 6 1 0 |
| do. do. 6 % Pref. ... | 1 | 6 | 6 | 1¼ | — | 5 6 8 |
| Edmundson's Ordinary ... ... | 3 | 7 | 7 | 5 | — | 4 4 1 |
| do. 6 % Pref. ... ... | 5 | 6 | 6 | 5⅝ | — | 5 11 7 |
| Kensington Ordinary ... ... | 5 | 12 | 14 | 9½ | — | 7 3 7 |
| London Electric ... ... ... | 1 | 10 | 10 | 31/- | — | 6 9 0 |
| do. do. 6 % Pref. ... | 5 | 6 | 6 | 5⅛ | — | 5 11 7 |
| Metropolitan ... ... ... | 1 | 8½ | 10 | 1¾ | — | 5 14 3 |
| do. 4½ % Pref. ... ... | 1 | 4½ | 4½ | 17/-xd | — | 5 6 0 |
| Newcastle-on-Tyne Ordinary ... | 1 | 2½ | 6 | 18/9 | — | 6 8 1 |
| do. 5 % Pref. ... | 1 | 5 | 5 | 17/- | — | 5 17 2 |
| do. 7 % Pref. ... | 1 | 7 | 7 | 24/- | — | 5 16 1 |
| Notting Hill 6 % Pref. ... ... | 10 | 6 | 6 | 9½ | — | 6 6 4 |
| North Met. Elec. 6 % Pref. ... | 1 | 6 | 6 | 21/8 | — | 5 13 0 |
| Urban Ordinary ... ... ... | 1 | — | 4 | 19/3 | +6d. | 4 3 1 |
| do 6 % Pref. ... | 1 | 5 | 6 | 1 | — | 6 0 0 |
| St. James' and Pall Mall ... | 5 | 14½ | 17½ | 13¾ | — | 6 10 10 |
| South London ... ... ... | 1 | 11 | 15 | 43/3 | — | 6 18 7 |
| South Metropolitan Pref. ... | 1 | 7 | 7 | 1¼ | — | 5 12 0 |
| Westminster Ordinary ... ... | 5 | 12 | 15 | 10½ | — | 7 6 4 |
| Whitehall Elec. Invst. 7½ % Pref. | 1 | 7½ | 7½ | 20/6 | —1/- | 7 6 4 |

### Home Rails.

| | | | | | | |
|---|---|---|---|---|---|---|
| Central London Ord. Assented Stock | 4 | 4 | 68½ | — | 5 15 10 |
| Metropolitan ... ... ... ,, | 3½ | 4 | 80 | — ½ | 5 0 0 |
| do. District ... ... ,, | 3 | 3½ | 51 | — ½ | 6 17 1 |
| Underground Electric Ordinary | 10 | Nil | Nil | 2½ | — | Nil. |
| do. do. "A" ... | 1 | Nil | Nil | 7/6 | — | Nil |
| do. do. Income Bonds | 5 | 6 | 91 | —2 | *6 11 10 |

### Telegraphs and Telephones.

| | | | | | | |
|---|---|---|---|---|---|---|
| Anglo-Am. Tel. Pref. ... ... | Stock | 6 | 6 | 109½ | — | 5 15 0 |
| do. Def. ... ... | ,, | 1½ | 1½ | 23½ | — ½ | 6 6 4 |
| Chile Telephone ... ... ... | 5 | 6 | 6 | 6¾ | — | 4 9 0 |
| Cuba Sub. Ord. ... ... ... | 10 | 7 | 7 | 7 | — | 10 0 0 |
| Eastern Extension... ... ... | 10 | 10 | 10 | 16¾ | + ½ | 5 19 5 |
| Eastern Tel. Ord. ... ... ... | Stock | 10 | 10 | 167½ | +3 | 5 19 5 |
| Globe Tel. and T. Ord. ... ... | 10 | 10 | 10 | 17½xd | + ¾ | 5 14 3 |
| do. do. Pref. ... ... | 10 | 6 | 6 | 11½xd | + ½ | 5 7 10 |
| Great Northern Tel. ... ... | 10 | 24 | 22 | 37½ | — ½ | 8 0 |
| Indo-European ... ... ... | 25 | 7 | 7 | 32½ | — | *5 6 1 |
| Marconi ... ... ... ... | 1 | 15 | — | 1½ | — | 10 0 0 |
| Oriental Telephone Ord.... ... | 1 | 12 | 12 | 1¼ | — | *6 8 9 |
| United R. Plate Tel. ... ... | 5 | 8 | 8 | 6¾ | — | *5 18 6 |
| West India & Panama ... ... | 10 | Nil | Nil | 1/- | — | Nil |
| Western Telegraph ... ... | 10 | 10 | 10 | 16¾ | + ½ | 5 19 |

### Home and Foreign Trams, &c.

| | | | | | | |
|---|---|---|---|---|---|---|
| Anglo-Arg. Trams First Pref.... | 5 | 12½ | 5½ | 8⅞xd | — | 8 12 6 |
| do. do. 2nd Pref. ... | 5 | 5½ | 6 | 9⅛xd | + ⅛ | 10 4 4 |
| do. do. 5% Deb. ... | Stock | 5 | 5 | 73½ | +1 | 6 18 0 |
| British Electric Traction Ord.... | ,, | 5 | 5 | 93xd | +6 | 6 19 0 |
| do. do. 6% Pref. ... | ,, | 6 | 6 | 109½ | +3½ | 5 10 0 |
| Brazil Traction ... ... ... | 100 | 4 | 4 | 89½ | +2½ | 6 14 6 |
| Brit. Columbia Elec. Rly. Pcs. | Stock | 5 | 5 | 87½ | — | 5 14 3 |
| do. do. Preferred | ,, | 5 | 90/- | 84½xd | — | *5 19 6 |
| do. do. Deferred | ,, | 8 | 127/- | 100½xd | — | *6 8 6 |
| do. do. Deb. | ,, | 4½ | 4½ | 81½ | — | 5 4 4 |
| Lond. & Sub. Trac. 5 % Pref. ... | 1 | 5 | 2½ | 7/- | — | 7 2 10 |
| London United Tram. Deb. ... | Stock | 4 | 4 | 47xd | — | 8 10 2 |
| Mexico Trams. 5% Bonds ... | — | Nil | 5 | 70½ | — | 7 1 10 |
| do 6% Bonds ... | — | Nil | Nil | 48½ | — | Nil |
| Mexican Light Common ... | 100 | Nil | Nil | 18 | — | Nil |
| do. Pref. ... ... | 100 | Nil | Nil | 44 | —2½ | Nil |
| do. 1st Bonds ... | — | 5 | 5 | 68½ | —2 | 7 17 6 |

### Manufacturing Companies.

| | | | | | | |
|---|---|---|---|---|---|---|
| Babcock & Wilcox... ... ... | 1 | 20 | 12 | 47/6 | — | *5 1 1 |
| British Aluminium Ord.... ... | 1 | 5 | 5 | 25/- | +6d. | 4 0 0 |
| British Insulated Ord. ... ... | 1 | 15 | 15 | 26 | — | 5 14 3 |
| Callenders ... ... ... ... | 1 | 15 | 15 | 2⅛ | — | 5 17 0 |
| do. 6½ Pref.... ... ... | 1 | 6½ | 6½ | 23/3xd | — | 5 11 10 |
| Crompton Ord. ... ... ... | 1 | 5 | — | ⅞ | — | 8 17 10 |
| Edison-Swan ... ... ... | 4/- | 7½ | — | 8/- | — | 6 0 0 |
| do. ,, 5% Deb. ... ... | Stock | 5 | 5 | 75½xd | — | 6 12 5 |
| Electric Construction ... ... | 1 | 10 | 10 | 1½ | + ⅛ | 6 13 4 |
| English Electric ... ... ... | 1 | 8 | 5 | 16/9 | — | 5 19 6 |
| do. do. Pref. ... ... | 1 | 6 | 6 | 19/6 | — | 6 8 1 |
| Gen. Elec. Pref. ... ... ... | 1 | 6½ | 6½ | 22/- | — | 5 13 1 |
| do. Ord. ... ... ... | 1 | 5 | 5 | 20/3 | +6d. | 4 18 9 |
| Hanley ... ... ... ... | 1 | 15 | 15 | 2½ | + ⅛ | 5 11 6 |
| do. 4½ Pref. ... ... ... | 5 | 4½ | 4½ | 4½ | + ½ | 5 6 0 |
| India-Rubber ... ... ... | 1 | 10 | — | 4½ | — | *7 5 0 |
| Met.-Vickers Pref.... ... ... | 2 | 8 | 8 | 2⅞ | — | 6 11 3 |
| Siemens Ord. ... ... ... | 1 | 5 | — | 18/9xd | — | 5 6 9 |
| Telegraph Con. ... ... ... | 12 | 20 | 20 | 24½ | + ½ | *4 17 7 |

* Dividends paid free of Income Tax.

# The Incorporated Municipal Electrical Association.

## Annual Convention at Chester.

*(Continued from page 1060.)*

On Friday morning, June 20th, after a Council meeting, the annual general meeting was held at the Town Hall. The officers were elected without opposition, Mr. W. C. P. Tapper (Stepney) being the new president and Mr. R. B. Mitchell, vice-president. The place of meeting next year was left for the Council to settle.

The honorary officers were re-elected, namely, Mr. A. C. Cramb (hon. secretary), Mr. H. Faraday Proctor (hon. treasurer), and Mr. P. M. Heath (hon. solicitor).

The result of the ballot for new members of Council was the election of the following:—

Large towns, engineers: Messrs. A. Nichols Moore, S. J. Watson, F. W. Purse, and J. K. Brydges.

Small towns, engineers: Mr. E. Calvert.

Committee-men: Dr. Dewar, Councillor A. J. Ward.

Mr. S. T. Allen (Wolverhampton) urged undertakings to participate in the E.D.A. show at the British Empire Exhibition, even now. He emphasised the fact that this was the biggest co-operative effort ever carried out in the electrical industry, and that all sides of the industry must benefit from it. Mr. Staniland referred to the scarcity of good jointers, and it was agreed that a sub-committee should confer with the cable makers with a view to setting up a system of training. Association premiums of £10 each were awarded to the authors of the technical papers, Messrs. Miles and Waite.

Councillor Sutcliffe (Burnley) moved a resolution protesting against the transfer of electricity generation from municipal hands to power companies by the Electricity Commissioners, and demanding provision for appeal against the decisions of the Commissioners. Councillor Johnson (Southend) supported the resolution, but Ald. E. Huntsman (Nottingham) pointed out that the power companies possessed statutory powers which the Electricity Commissioners could not over-ride, and said the latter were doing their best in the national interest. They should try to get a new Act passed, to remove the obstacles that impeded the progress of electricity supply. The resolution was carried.

A special meeting was held to consider proposed changes in the articles of association, which were adopted after a long discussion.

Votes of thanks were accorded to the Mayor and Mayoress of Chester, the Electricity Committee and its chairman, E.L.M.A. and E.D.A., and the firms which took part in the exhibitions, &c., and to the honorary officers, especially the president; thanks were also cordially awarded to the secretary, Miss Lanfear, and her staff, who had successfully coped with an attendance which had unexpectedly increased by nearly 50 per cent. over the previous record. Certainly the manner in which Miss Lanfear carried out the preliminary arrangements and conducted the affairs of the Association throughout the Convention was beyond praise, and the notable success of the event was largely due to her foresight, tact, and discretion.

The Town Hall, Chester.

Starting on the River Trip.

At the Lodge Gates, Eaton Hall.

For the afternoon of Friday the arrangements included a visit to Messrs. Lever Bros.' Soap Works, Port Sunlight, a trip to Llangollen, and the I.M.E.A. competition at Chester Golf Club. In the evening there was a social and dance at the Grosvenor Hotel.

The programme for Saturday was restricted to a visit to the hydro-electric power station at Dee Bridge and a tour of the rural districts near Chester, to inspect the overhead lines and outdoor sub-stations employed for the distribution of electricity in these sparsely populated areas at 6,000, 3,000, and 230/400 volts.

*(To be concluded.)*

Arriving at Iron Bridge.

The Boat Race—one of the Heats.

The Boat Landing at Iron Bridge.

## Power Plant Chemistry.

By W. M. MILES, A.I.M.E., F.C.S. (*Abstract.*)

(*Concluded from p.* 1061.)

### Fireclays and Refractory Materials.

THE modern demand for increased boiler ratings and output has necessitated more rigid supervision of steam boiler operation which, by decreasing the amount of excess air required, has resulted in higher furnace temperatures; consequently the question of refractories has become one of the greatest importance. Whilst much depends on correct setting, drying out, and nature of furnace atmosphere, the most suitable firebrick for any particular plant can only be detected, and maintained, by systematic sampling, testing and research work.

It would seem from present day experiences, particularly with pulverised coal, that the capacity of automatically fired furnaces is limited only by the ability of the firebrick to withstand the extreme temperatures encountered.

Attempts have been made to use material of higher melting point than ordinary fireclay, such as silica, bauxite, chromite and magnesite, but they have failed to realise the theoretical expectations.

The fusion points of fireclays may be determined in a similar manner to those of firebricks and boiler ash; in the absence of suitable apparatus, however, a useful approximation can be obtained by using a modification of the formula given for ash fusion points, which is as follows:—

$x = (17.01A + 15.56B + 6.06C) \times 1.050$ = fusion temp. °C.

Silica bricks made from the rock, or ganister as it is sometimes called, and bonded with about 2 per cent. lime, are unsuitable for boiler furnace work, particularly arches, as they fail to withstand the sudden changes of temperature without spalling.

A great deal of trouble in furnace settings is due to improper selection and ignorance in the use of materials, also careless workmanship in constructing and laying up the work.

Wherever possible, bricks of the same shape and thickness should be used in the same row; a good workman will cut out those of irregular shape and try the selected bricks dry over the arch form with a straight edge before dipping them into a creamy solution of fireclay and rubbing them into place.

All refractory firebricks should be set in fireclay of nearly the same composition, to prevent any undue fluxing action, whilst with fireclay bricks, good fireclay of refractoriness equal, or nearly so, to that of the bricks should only be used.

Bricks cannot be selected for furnace work on analysis alone, which merely indicates the chemical composition without giving any information as to the physical properties. Physical structure, rate of heating and nature of atmosphere play a very important part as to the fusing point.

The fusing point of refractory material is determined by experiment in suitable gas or electric furnaces using either the Seger cones, the pyrometer, or a combination of cone and pyrometer. The last is to be preferred, as the cones take into account the time element, which is very important for determining the capacity of a brick to hold heat.

Fusing-point temperatures obtained in the laboratory are often higher than is actually the case in practice, due to the absence of the action of ash or clinker and the effect of furnace gases. On the other hand, in the laboratory test furnace the brick is surrounded, or soaked, in heat without any chance for radiation as afforded in some types of furnaces.

Although the determination of the fusing point provides some approximation of the fusing properties of a brick, it does not take into account compression such as may be experienced in practice. A more useful test was introduced by the United States Laboratory some years ago, where a brick stood on end and loaded 50 lb. per sq. in. cross section has to withstand a temperature of 2,400 deg. Fah. for one hour without showing any deformation, spalling, or contraction greater than ¼-in. in length. Under the load test with impurities present, the fluxing action occurs at a lower temperature, causing the bricks to soften and allowing them to compress.

Spalling, which is the "popping-off" of large pieces of the bricks, is often due to the absorption of moisture. It is essential therefore that all brickwork be slowly dried before being exposed to working temperatures. Spalling is also the result of contraction, following the chilling of incandescent bricks by sudden inrushes of cold air. This often happens when fire doors are open too long, or the bareing of grates due to clinker, or uneven combustion, permits large volumes of cool air to impinge on one place in the refractory material.

It can be seen from the foregoing that the selection of firebricks should not rest wholly upon the laboratory tests, but that the behaviour under actual conditions should be the chief factor.

### Insulating Oils.

Samples of selected oils and future consignments of these should be systematically tested, whilst samples from each transformer should be tested at least annually to indicate any possible deterioration or presence of undesirable matter.

The apparatus and tests necessary are described in the British Standard Specifications, and do not require any special mention here, with the exception of the test for the sludging tendency, which, although of the greatest importance, still requires improvements in the way of correct air measurement to obtain comparative results.

The data obtained from the standard methods of testing will enable the most suitable oil to be found, but the real problems for investigation and solution are the troubles affecting insulating oils in use.

The deterioration and life of any insulating oil depends to a great extent on transformer design, load factor, temperature, nature of surrounding atmosphere, and the methods adopted for the systematic removal of impurities and sludge at specified intervals.

Although water is only slightly soluble in oil, without special sealing tanks, transformer oil will in time gradually absorb up to 0.10 per cent. of water which, together with the effect of other impurities (chiefly fibrous matter) may reduce the dielectric strength by 30 to 40 per cent. as compared with that of the original clean dry oil. This, however, applies more to outdoor transformers.

Dust, especially that of a metallic nature, is detrimental to the insulating properties of oil and, as with water, every possible means should be adopted to exclude it from the windings and transformer interior. It is not unlikely that cotton fibres will be found the most detrimental factor. Mr. T. A. McLaughlin, M.Sc., states that these fibres are not really dangerous unless water is present, when they become damp.

Where, on periodic examination, water or other impurities are found to be excessive, suitable treatment in the form of heat, filtering press, or, better still, the centrifugal or De Laval system of purification, should be applied. Linseed oil, used for impregnating binding tapes, is sometimes dissolved by the insulating oil at elevated temperatures, whilst cases of deterioration have been found due to the windings being immersed before the impregnation compound was dry.

The linseed oil, when dissolved by the insulating oil, may cause trouble from the fact that it has absorbed oxygen in drying prior to being dissolved, this causing precipitation and forming additional impurities in the oil.

Sludging is largely due to the presence of oxygen in the oil, and is greater at high temperatures; unlike the oxygen in feed water, which with suitable apparatus can be eliminated, that in transformer oil will always constitute a difficulty and will not be easily removed.

In water-cooled transformers the tendency to sludge is considerably neutralised due to the lower temperatures maintained, whilst air cooled transformers, housed with adequate ventilating conditions, show less deterioration in oil than those placed in restricted air supply. In many scientific experiments it has been found that chemical action doubles for each 10 deg. C. rise in temperature, and it is not unlikely that the oxidation of transformer oils under electric stress at these elevated temperatures is following the same law.

Usually the formation of sludge is accompanied by an increase in viscosity, specific gravity and acidity, with a slight lowering of the flash point and a deepening of colour in the oil.

Sludge as found in transformer oil is acid in nature; this, however, is due to the presence of weak petroleum acids, which are more or less harmless (and must not be confused with the inorganic acids which are deleterious), and depend greatly on the method and grade of refining. It has been proved that oxidation is not due individually to either electric stress or temperature, but to a chain of conditions.

The colour of these deposits varies considerably, and depends not only upon the composition of the oil but also to a certain extent upon the impurities from the materials of the transformer tank, switches, &c. Much benefit, and longer life, would be obtained if more attention was given to the sampling, washing, and filtering of oil in service from time to time, and there seems no reason why adequate and suitable plant should not be more generally used by electrical undertakings.

The oil as received is first tested for dielectric strength, after which approximately one litre is filtered through an 8-9 in. paper into a dry, clean vessel. 500 c.c. of the filtered oil is reserved in an airtight bottle for future reference, and the remainder is systematically examined for dielectric strength, specific gravity, viscosity, flash point, moisture, acidity, and loss by evaporation, the colour of the oil being also noted. Special tests, such as the sludging value, iodine value, solidification point, &c., are also carried out as required.

Should an appreciable amount of deposit be left in the filter paper, its percentage in relation to the sample is first determined. Absolute accuracy is not essential for this determination, the sampling being unavoidably very crude owing to the uneven distribution of the deposit throughout the transformer or switch tank.

The "Redwood" instrument is very useful, and more or less accepted as standard, for determining the viscosity of an oil. The time taken for 50 c.c. of the oil at 60 deg. F. to flow through a standard orifice from a definite head is known as the Redwood Seconds. This compared with the time taken for an equal volume of rape oil to flow under the same conditions is called the relative viscosity.

The Pensky-Martin apparatus is generally taken as standard for flash-point determination.

No suitable convenient quantitative method has yet been devised for the determination of small percentages of moisture in oil. The following simple qualitative test, however, finds general use, and is sufficient for switch and transformer oils:—

Add about 10 cc. of the sample to a perfectly dry test tube, and heat to boiling over a naked gas flame; traces of moisture will be detected by a distinct cracking noise, whilst with larger

quantities a film of moisture is noticed on the cooler part of the tube above the oil. No cracking indicates no moisture present.

Loss by evaporation is the percentage loss by weight after heating the oil under constant conditions at 100 deg. C. for eight hours. One of the best methods now in use is the toluene vapour bath.

### Lubricating Oils.

In view of the high speeds at which steam turbines and alternators are operated the lubrication must be of the highest order. This can only be attained by the use of high-grade oils of proved suitability, those of inferior quality deteriorating much too quickly for economic employment.

Naturally, the choice of the initial oil rests upon the chemist's investigations, and he is also relied upon to provide information of the deterioration during use, the tests required being the same as those carried out for the ordinary examination of insulating oils. The life of a lubricating oil varies with the running conditions, methods of cooling, purifying, &c., the progress of wear generally resulting in (1) Deepening of colour, (2) Increased specific gravity, (3) Increased viscosity, (4) Increased acidity, and (5) The formation of emulsions, and the separation of various deposits.

Any variations or increases in Nos. 1, 2 and 3 cannot be said to be really detrimental, although they give warning of wear, and the extent of use. The acid value, which is the result of oxidation, indicates petroleum acids of deleterious nature; these have no marked effect on the lubricating system as a whole, but gradually attack the bearing metal. The acidity, therefore, may be taken as a guide to judge the amount of wear on an oil, and various authorities have advised that when the region of .2 to .3 per cent. in terms of $SO_3$ is approached means should be adopted to prevent this limit being exceeded, by renewing part, or the whole, of the oil as the circumstances permit, or placing in the circuit special plant for eliminating the acids.

The principal causes of oil deposits are (1) Water, (2) Solid and foreign matter, (3) Heat and air, (4) Electrolytic action, and (5) Addition of new oil.

Water has an emulsifying effect on oil, varying with the amount of dissolved impurities present, considerable amounts imparting a brownish yellow colour to the oil.

If a sample of oil containing water is taken from a system and heated, there will be three distinct sections: (Top) clean oil, (middle) film of sludge or emulsion, (bottom) water of milky appearance. The film, when analysed, shows a fair amount of oil and petroleum acids, together with rust and other suspended matter, which gives considerable trouble due to clogging up the system.

Impurities from the steam, or rust, &c., from the metal-work of the lubrication system, have a detrimental effect on the oil, which darkens in colour and increases in acidity. At the same time a black sludge develops and settles in the oil cooler; if water is present the development of the sludge is greatly accelerated.

From time to time the oil should be changed, and the old oil treated by a suitable pressure filter, or centrifugal apparatus, to remove the accumulated deposit before it is used again.

As with transformer insulating oils, the continual oxidation at high temperatures has a marked effect on lubricating oil, but the increase in viscosity, acidity, &c., due to rapid circulation and work done, is more pronounced than in the former case, and washing and filtration must be carried out at suitable intervals.

Where stray current or leakage (circulating shaft current) exists in a lubricating system the tendency is to considerably increase the amount of sludge and the rate at which it is formed, whilst the oil, which darkens in colour, increases in acidity and produces a deposit which is general throughout the system and, naturally, particularly in the oil cooler. The deposit is usually of a hard brittle nature having a chocolate colour, and is objectionable because of the great difficulty of removing it. The remedy is completely to insulate electrically one of the main bearings from the turbine bed plate, including the connections between the old pipes and that particular bearing; this provides a problem more for the electrical engineer than for the chemist.

Where different metals (such as iron and copper) are used in the system there is a tendency for local galvanic action to increase the formation of sludge, while the presence of moisture and other imperities augments the trouble.

The addition of new oil to old, whilst giving new body and lubricating properties according to the amount, has a peculiar effect in that a considerable deepening of colour occurs and the acid value increases rapidly. The action is more particularly experienced when the amount of water present is low and the quantity of make-up oil small, and is more marked on high-viscosity oils than those of lighter grades. It is due to the action of the old oil on the new, which causes a dark deposit to be thrown into suspension throughout the system.

### Scientific Instruments.

The extent to which the information derived from the indicating, or recording, apparatus of the plant or boiler house is used for the purpose of increasing efficiency and eliminating waste is the measure of their value to the purchaser. In many cases the use, and sometimes abuse, of these instruments by inexperienced operators has caused their utility to be questioned, and it is always advisable that proper care and attention should be given by a skilled man. Again, they should not be regarded as toys, but as part and parcel of the boiler room proper, and useful tools without which no conscientious operator can carry out his duties.

There are many types of $CO_2$ indicators and recorders on the market, which in proper hands indicate the relative abilities of the different firemen to obtain the best results. Having found from a series of tests the correct draughts, fire thicknesses, speeds of grate, &c., to obtain the best $CO_2$ from the fuel and type of grate, these instruments will indicate any change from the prescribed conditions, and investigations as to the cause should be carried out immediately.

Although entailing little cost draught gauges are often conspicuous by their absence, while in many cases they are installed in such a manner that they cannot be seen, and sometimes the method of fitting gives anything but correct interpretations. It is very difficult to get some firemen to realise that there is a definite relation between draught and efficient combustion; consequently the speed of grate, and thickness of fire, may be altered many times a shift without any changes of draught being made. An intelligent use of the draught gauge undoubtedly leads in the right direction, and as the greatest loss in boiler operation is due to excess air leaving by way of the chimney, too much attention cannot be given to the matter.

There is a draught which will carry the load on a boiler efficiently, and enable $CO_2$ of 11 to 14 per cent. to be obtained; this should be found by testing and set as a standard to which the men must work.

The calibration of thermometers, used with the power plant, is very seldom carried out even by large undertakings. These, like any other instrument, should be tested and standardised by a competent assistant to ensure that any data returned are accurate.

With steam flow meters, Lea recorders, Venturi meters, $CO_2$ apparatus, or even draught gauges, regular attention and cleanliness are essential for their useful interpretation.

The author thanks Mr. S. E. Fedden, Chief Engineer, Sheffield, for the facilities provided in the preparation of this paper; also Mr. A. Dunn, for his able assistance.

[The paper was accompanied by numerous tables and charts.]

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## Public Electricity Undertakings.

By COUNCILLOR W. HAMMER, J.P., Mayor of Hackney.

*(Abstract.)*

THE public electricity supply undertakings of Great Britain sell about 3,100,000,000 kWh per annum. The main purpose of a public undertaking should be public service. In our dense and complicated communities of to-day almost any business, if it become big enough and with a wide enough *clientèle*, develops into a sort of public undertaking. Such an undertaking has a definite responsibility to the public, even if its prime object is the collection of dividends or the making of profits.

The supply of electrical energy can no longer be regarded as a mere trading venture. Electricity furnishes a new and radical change in the method of doing old tasks, whether in the home, shop or factory.

The supply of electrical energy in a particular area is in the nature of a monopoly, and it is right, in these circumstances, that the supply should be in the hands of a municipality which can give full service, including the supply of apparatus and fittings.

The use of electricity is undoubtedly playing an important part in smoke abatement in urban areas. Medical science is just beginning to realise the value of sunlight in maintaining the health of the individual, and it is only by the extensive use of electricity that the smoke pall over the cities can eventually be lifted. Steam locomotives on the railways should not be allowed within 20 miles of Charing Cross.

Dealing with the policy of the public undertaking, and taking first the basis of charge to the consumer, should this be the cost of production or the value of the service to the consumer? In the author's opinion, the basis of cost is not necessarily the best method of calculating the charges for the supply. Cheapness of electricity is dependent upon a very diverse load—a mixture of industrial and business and domestic applications. There are many instances where the price for lighting could never have fallen so low but for the industrial character of the district, and it begins to emerge very clearly that the complete success of an undertaking depends largely upon how it can mix the loads. As regards new mains and service extensions, free service to all consumers is the ideal to be sought. There is some justification for the plea that rather than have to keep up charges for energy to the general body of consumers in order to pay for new mains and service extensions, it is the better policy to charge for this work and keep down the charges for energy. The author, however, holds the view that consumers should be enabled to take a supply without their being charged for the means of supply. To this end an undertaking should develop its mains system on a definite plan and provide for its whole area to be covered. If this be done in conjunction with the lighting of street lamps by electricity, so much the better.

With regard to the policy of advertising, a community providing itself with electricity does not advertise in the ordinary sense of the word, that is to say, it is not competing with

another vendor of the same commodity. It offers something new or something better. Supply undertakings can advertise electricity, as such, through a central organisation, without bothering very much to emphasise their own particular business, and this can now be done through a non-profit earning association, payment to the funds of which has been legalised by Sect. 30 of the Act of 1919.

Where both gas and electricity services are in the hands of a municipality, it is better to let them develop individually, as separate organisations. Competition between suppliers of electricity and gas has been of great value to the public, as it has raised the standard of lighting, stimulated invention, and given greater facilities and new methods of using heat and energy more economically.

There is a general hardening of opinion against using the profits of municipal undertakings for the relief of rates. The only possible justification for those who are of the contrary opinion is that the general body of ratepayers is a sort of guarantor for the undertaking, and it is probably for this reason that a municipal undertaking can borrow money more cheaply than a company undertaking; but the risk run by the ratepayer is really very small. The Stoke-on-Trent Corporation Act, 1923, rightly prohibited the placing of surplus profits to the relief of the rates.

With regard to the management of a public undertaking, the proper policy is to get the best engineer that can be found, pay him well, and leave the details of the management to him. The Municipal Committee should not so much manage the undertaking as watch the policy and its effect.

In some quarters the recent attempt to deal with the remuneration of chief engineers is not considered adequate for engineers of first-class qualifications and experience, but the author is confident that if those who are responsible for the management of municipal undertakings will examine the proposed basis they will eventually agree to adopt it as the minimum.

In conclusion, it is realised to-day that a successful supply undertaking must not only generate cheap electricity, but must organise an effective sales department. The majority of the public consumers of this country have never had anything better than a scanty lighting installation, but the market for electricity in years to come is in the home. In this connection the contractors and manufacturers should be given a free market for electrical apparatus. The trade is handicapped because the manufacturer has to produce his appliances in dozens of voltages and periodicities, and the retailer has either to keep a very large stock or subject the consumer to delay in delivery. The electrical supply industry should work towards the unification of periodicities and pressures over large areas. The ordinary layman compares the present conditions in the supply of electricity with the simplicity of the distribution of gas, to the disadvantage of the former.

### Discussion.

Mrs. ALDERMAN HAMMER said she agreed with everything in the paper, and particularly with regard to keeping the profits for the benefit of the undertaking.

Councillor ODELL (Ilford) said that some undertakings were suffering under difficulties owing to the refusal of the Electricity Commissioners to sanction loans for extensions. This was, in effect, putting the bar up against the smaller authorities, who nevertheless claimed that they could generate economically. The result in Ilford had been that last year they had had to refuse to connect would-be consumers.

Councillor TAYLOR (Chairman of the Electricity Committee, Chester), suggested that what was needed for an ideal Electricity Committee was that the chairman and a few others should have a knowledge of the details and the others should be good business men. It was not necessary that the members should know anything about electricity—in fact, in most cases it was better they should not. More should also be done to increase the enthusiasm of the public, and one good means to this end was an efficient showroom. In many cases, at present, the public did not know the many uses of electricity. The Chester Committee held the opinion that having generated the current, everything possible should be done to provide uses for it.

Mr. B. SANKEY (Johannesburg), who was specially called on by the Chairman, gave some information with regard to the general conditions in his town, where he is also manager of the gas works. He said there was no gas lighting done of any kind, but nevertheless the electrical and the gas undertakings were making such rapid progress that they could not keep pace with the demands. In South Africa there was not a great difference between the hours of daylight in mid-summer and mid-winter, and this resulted in a steady revenue from lighting all the year round. Last year his electrical undertaking made £92,000 profit. He supported the view that profits should be kept in the undertaking. The policy of his Council was to extend mains wherever a supply was asked for. There were 92 suburbs in Johannesburg, and the total area was 84 square miles. In many cases estate companies provided the capital free of interest, and when the supply reached "payability," the money was refunded less 2½ per cent. for depreciation. This was usually done when the revenue from the area amounted to 25 per cent. per annum of the capital outlay. The same arrangement was sometimes entered into with individuals. A plan of the whole area had been prepared, so that mains could be laid on a co-ordinated plan whenever an application was made. He did not agree that unrestricted competition with gas, as the author said, was the best system. His experience rather led him to think that if both undertakings were placed in the hands of a suitable manager the best development of them would be obtained. Unrestricted competition meant duplication of expenditure and in the end the consumer had to pay. By having the two undertakings under one manager there was a restricted monopoly, which was the best in the end. In Johannesburg he was connecting 150 to 200 consumers per month, and the gas undertaking had to refuse more consumers until it got a new gasworks.

Alderman JONES, M.P. (West Ham), expressed the view that the question of making profits should come second to serving the public and saving life. The one object should be to make electricity of the greatest possible use to the residents.

Mr. GUY ALLBUT (Newcastle, N.S.W.), also specially called on by the President, gave information regarding the conditions there. The municipalities in Australia were a little ahead of Great Britain, in that the electrical department managed the whole business including the accounts, whereas in this country the accounts were mostly handled by the Borough Treasurer. As to extending mains, his Council took the view that every person who asked for a supply should get it. They had not refused a single application so far. The distribution was entirely overhead, but the lines were being placed underground in the city portion. Legislation also provided that all the profits should remain in the business. He did not know what gas competition really was except as regarded cooking, and that was being tackled by electricity now.

Alderman F. SMITH (Liverpool) expressed the view that there should be some allocation of profits to the relief of rates.

Councillor WARD (Sheffield) said that the question of allocation of profits to rates must depend upon circumstances. In Sheffield they had, soon after the war, when rates were 23s. in the £, assisted the rates out of electricity profits, but as a matter of general policy the undertakings must be run as business concerns. In municipal electrical undertakings the manager should be given a free hand without pinpricks from the Committee. In many cases it would be an advantage if the engineer had a good commercial man to relieve him of this part of the work, because he had too much to do otherwise.

Councillor MATTHEWSON (Chester) said the idea still existed in some quarters that electricity was a luxury to be enjoyed only by the rich, but from experience he could say that it was a great labour-saver for the ordinary working housewife. Everything must be done to create the right atmosphere for the fullest development of the uses of electricity.

Alderman HAMMER, replying to the discussion, said he would like to put a showroom on wheels and take it to various parts of the district from time to time. He was convinced that the principle of having Electricity Commissioners was right, although they might criticise the details and machinery of operation. Mr. Sankey's views on competition between gas and electricity were no doubt coloured by the conditions under which he worked, and those conditions did not apply here. On the question of finance, mentioned by Mr. Allbut, in Hackney this matter was entirely in the hands of the Borough Treasurer, and that, at any rate, had the advantage of preventing it being said that the accounts were being rigged by the Electricity Department. Personally, he thought that was the best policy.

### Demonstration of Modern Lighting Methods.

WITH the aid of E.L.M.A. and E.D.A., and a number of manufacturing firms, a most effective demonstration of modern methods of electric lighting for the home, the office and the shop, was organised on the premises of Messrs. Brown & Co. (Chester), Ltd. The Lighting Service Bureau of the E.L.M.A. played a prominent part in the work, its apparatus for demonstrating the vicious effects of glare, the necessity of providing proper light and shade, the colour effects of different types of lamp, the importance of correctly tinted lighting for pictures, the best methods of lighting show-windows, &c., being arranged round a large room, with various types of fitting, to show both bad and good methods of illumination, in the centre. Lectures were given on these exhibits by Mr. W. E. Bush.

In addition to this demonstration, a number of small rooms were completely fitted up with appropriate furniture by Messrs. Brown & Co., and equipped with electrical apparatus for lighting, ventilation, decoration, cleaning, and other uses by the Metropolitan-Vickers Electrical Co., Ltd., the General Electric Co., Ltd., the British Thomson-Houston Co., Ltd., the Hoover Suction Sweeper Co., Ltd., and others. Mention should also be made of the illumination of Messrs. Brown's principal window, in which striking effects were produced by coloured lighting, periodically changed by an electrical device.

The demonstration was open to the public as well as to the I.M.E.A., and must have produced a marked effect upon the minds of all who inspected it, as the arrangement and equipment were altogether admirable. Such a display ought to be permanently installed in every town where electricity is supplied, for it is well known that the layman is usually utterly ignorant of the principles of scientific illumination, and even if he (or she) uses the electric light, is often wholly unaware of the manifold "other uses" to which electricity is so perfectly adapted.

# Some of the Exhibits at Wembley.

## Watford Electric and Manufacturing Co., Ltd.

*(Stand No. N9, Avenue 15, Bays 6 and 7.)*

One interesting item in this exhibit is a frame upon which are mounted three automatic starters, showing the development of the Watford automatic motor starter. The first was developed in 1914, and employs a patented rheostat for cutting out the armature starting resistance, with an oil dash pot to give the adjustable accelerating time.

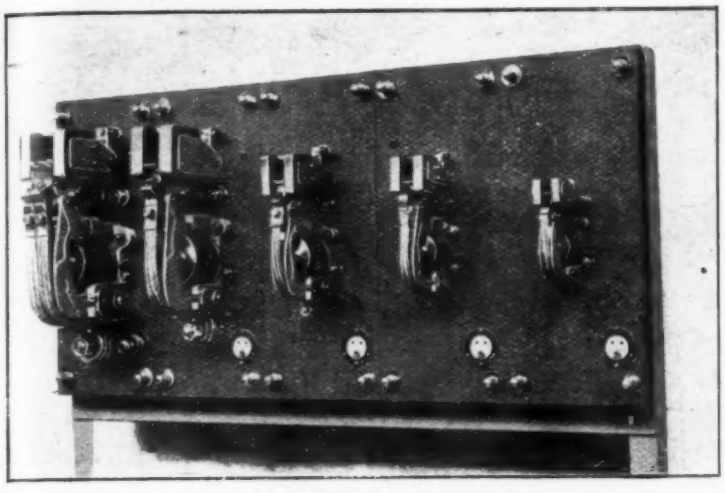

Fig. 125.—Range of d.c. Contactors.

The adjoining starter shows a modification in the construction of the rheostat, which was made in 1916, and in this type for the first time on any automatic starter, the oil dash pot was replaced by the eddy drag accelerating starting time adjusting device. The modern starter shown is one of a large order which the company has in hand for the Admiralty, and which is shown by permission.

The eddy drag retarding device, which replaces the oil dash pot, and is independent of temperature variations, provides a wide range of adjustment, and for ordinary starters the magnet coil in connection therewith is connected in series with the motor armature, so that the starting time is automatically adjusted to suit the starting load conditions on every occasion of start, thus giving a slow start due to the increased eddy currents produced in the retarding disk when starting with a heavy armature current and a quicker start when starting against a lighter load. The two original starters embody a main making and breaking switch, actuated from a common solenoid used for the rheostat, but the frequent need for "inching" in automatic starters generally, and the need for economic standardised production, prompted the company to discontinue the single solenoid starter and to utilise, as in the latest model, a separate contactor which is closed by a push button or other auxiliary contact-making device.

A second exhibit shows a complete range of direct-current contactors (fig. 125); gun-metal bearing bushes are provided for the hinge, and the patented "3-point lock" contact makes a device whereby the circuit is made and broken on a solid copper to copper rolling butt contact. The various control pillars exhibited are all ironclad in substantial sheet-steel and cast-iron enclosures, which contain slate slabs on which the apparatus is mounted.

Amongst the d.c. panels are the following pillar-type units:—A small printing press or machine tool control panel for motors up to 15 h.p., 220 V, with interlocked isolating switch, d.p. fuses, contactor for making and breaking circuit, fitted with overload release and automatic rheostat fitted with eddy drag retarding device which, in addition to accelerating the motor by cutting out resistance in the armature circuit, utilises a similar rheostat bar working in the opposite manner, which is so connected to a hand-adjusting shunt regulator that the motor always starts up on full field, and resistance is gradually inserted in the shunt up to the speed at which the hand shunt regulator has been set under the control of the one combined accelerating rheostat. Another pillar (fig. 126) used for similar purposes on motors up to 50 h.p. at 220 V comprises the same interlocked isolating switches, d.p. contactors with overloads in each pole, and a plain series accelerating rheostat, but used with a motor-operated shunt regulator for acceleration and deceleration of the motor control by shunt regulation.

A further pillar included in the exhibit shows a control gear for a 200-h.p. d.c. motor, in which the smallest size of rheostat is used as a master controller in such a manner that, instead of the rheostat carbons carrying the full current of the motor, it is used for energising in correct sequence, under the control of the eddy drag accelerating time retarding device, a series of contactors for cutting out the starting resistance.

Another pillar is a lift controller of special construction normally used for large motors or high-speed machines. The panel exhibited is suitable for a motor up to 30 h.p. at 220 V, and is fitted with a two-speed car switch, the detailed apparatus comprising two d.p. reversing contactors fitted with magnetic blowouts on each pole and with auxiliary contacts to give a uni-directional shunt field and also for dynamic braking when switching off. These contactors are electrically interlocked to prevent their being simultaneously closed, and also interlocked with the rheostat so that they cannot be closed until the correct starting conditions are re-established.

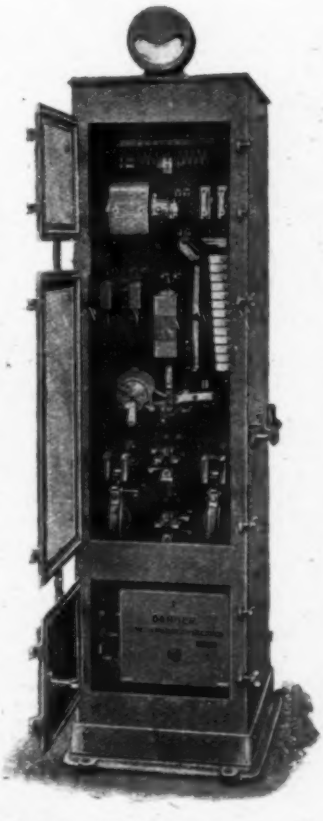

Fig. 126.—"Watford" Printing Press or Machine Tool Panel.

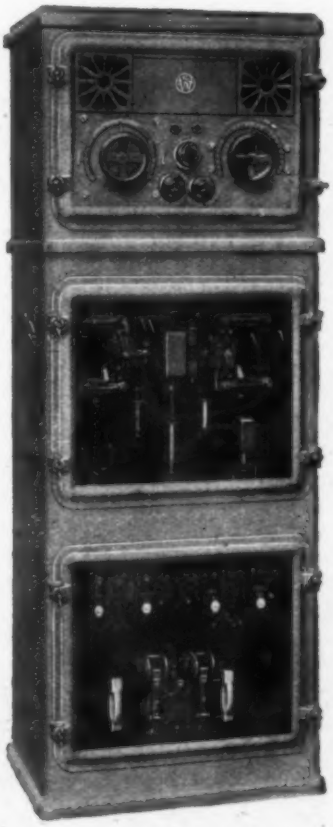

Fig. 127.—"Watford" Electric Furnace Control Panel.

The a.c. control gear has many features of similarity to the d.c. gear, notably in the design of the rheostat and in the eddy drag time retarded starting device. The alternating

current contactors employ the same "3-point lock" contact member, and the movement has been specially designed to ensure silent and efficient operation. A particular feature of the design is the patented silencing arrangement on the contactor whereby the hinged pin of the armature is carried in adjustable bearings, one on each side of the magnet system, to enable perfect alignment to be made between the laminated cores when the armature closes. One pillar in the exhibit illustrates an a.c. lift controller with two of these reversing contactors electrically interlocked, and used in conjunction with an alternating current accelerating rheostat with eddy drag accelerating device, suitable for use with a 20-h.p., 415 V, slip-ring motor, the rotor being star-connected through the medium of the neutral point presented by the bar.

Another exhibit of alternating current apparatus is an entirely new design of automatic starter for use with a 20-b.h.p., 415-V, squirrel-cage motor, starting up the machine by the star-delta system of connection.

The exhibit also includes a pillar manufactured by the company under its patents for the control of the electrodes of steel or alloy electric smelting furnaces (fig. 127). One of these control pillars is required for each electrode of an arc-type electric furnace, and, in addition to providing for hand control of the electrode, offers completely automatic control, maintaining the load at each electrode at any desired figure between full load and 20 per cent. of full load automatically according to the adjustment of the hand-regulating device through the whole of the process.

### New Pelapone Engine Co., Ltd.

(*Stand No.* 89, *Avenue* 13, *Bay* 5.)

Engines, lighting sets, and the necessary equipment for these are the subjects of this exhibit. The largest set on view consists of an 18-h.p., four-cylinder engine directly coupled to a 10-kW, 100/140-V, d.c. generator of the type illustrated in fig. 128. The engine is fitted with a sensitive governor running in an oil bath which controls not only the quantity of the mixture admitted to the cylinders, but also automatically regulates the quality of the charge. This gives highly sensitive governing, clean exhaust, and low fuel consumption at all loads. Lubrication is by means of a plunger pump and the filter is particularly well designed; it can be cleaned while the engine is running and all oil-ways are of exceptionally large area. A 2-kW set, driven by a 4-cycle vertical engine running at 600 r.p.m., is shown. The engine has forced lubrication, a

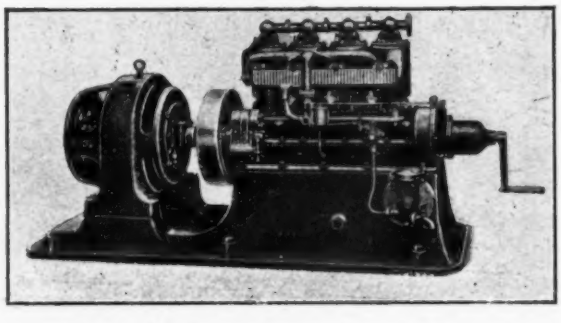

**Fig. 128.—A "Pelapone" Country House Lighting Set.**

sensitive governor running in oil, and a special vaporiser which gives good results at all loads. The drive is through a flexible coupling. A belt-driven set is shown. This has an engine similar to that of the last-mentioned set. The cast-iron bedplate is extended beyond the dynamo (2-kW) and carries a plunger-type pump capable of dealing with about 500 gallons of water per hour against a head of 80 ft. Another set shown is of the firm's "De Luxe" type, having an output of 2.5 kW. A single cylinder 4-b.h.p. "F" type engine is shown separately, and the remainder of the exhibit consists of switchboards for the plant described above. These have been designed for the rough usage which may be expected at times from unskilled labour.

### Messrs. Thomas Broadbent & Sons, Ltd.

(*Stand No.* 23, *Avenues* 6 *and* 7, *Bays* 20 *and* 21.)

Three types of centrifugal machines are shown upon this stand. The first is a 48-in. diameter suspended type hydro-extractor for textile goods. In this the rotor revolves round the centre spindle and drives through a centrifugal clutch. This device protects the motor from damage and at the same time considerably reduces the starting current. A smaller machine (30 in.) for use in laundries, &c., is also shown (fig. 129). As in the previous case the motor is incorporated in the machine and the spindle is fitted with the company's improved automatic friction clutch, so designed that the motor can attain full speed almost instantly, and the machine accelerates gradually without any strain on the motor or excess starting current. Ball bearings are used exclusively. The third machine is of an entirely different type. It is a swan-neck (36-in.) centrifuge with an overhead motor and belt drive (see fig. 130), and is designed for the treatment of ammonium sulphate, nitrates, common salt, and other granular chemical substances. The remaining exhibit is an arrangement for demonstrating the capabilities of the company's centrifugal clutch.

**Fig. 129.—A "Broadbent" Hydro-extractor.**

This consists of an 8-h.p. motor running at 1,000 r.p.m., fitted with a centrifugal clutch and pinion transmitting power to a brake-drum through reduction gearing giving a speed of 270 r.p.m. The manner in which the clutch picks up any load

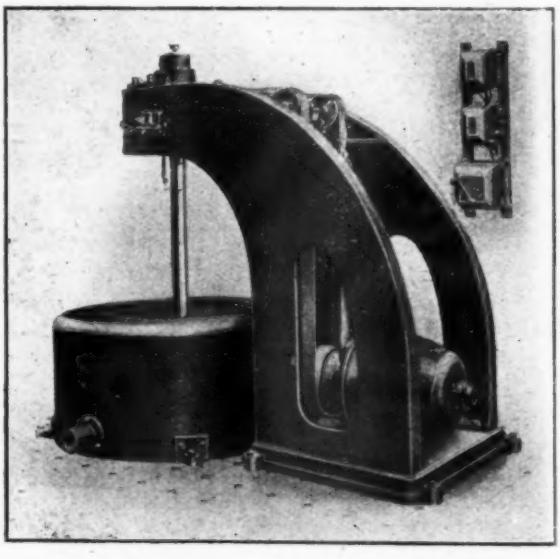

**Fig. 130.—A "Broadbent" Over-driven Centrifuge.**

within the capability of the motor is demonstrated by the loading of the brake lever with adjustable weights. The torque is registered on a spring balance, and the current is shown by an ammeter.

### The Synchronome Co., Ltd.

The "Free Pendulum," a development of the Synchronome system of electric clocks, is claimed to have surpassed every known record of accuracy in time measurement. It was the subject of a lecture by Mr. F. Hope-Jones, M.I.E.E., at the Society of Arts last April, and was exhibited at the Royal Society's Soirée on May 14th.

It would appear to be impossible, on the face of it, to devise a means of giving an impulse to a pendulum, which shall not require that pendulum to unlatch or release a small

instalment of the reserved store of energy. The solution of the problem lies in the use of a "slave clock" to perform this duty for it. It is enabled to do so at precisely the right moment, because its pendulum is kept in perfect phase synchronisation with the free pendulum.

Two examples of the free pendulum are to be found at the British Empire Exhibition, one in the Royal Society's exhibit in H.M. Government Building, and the other, which is the subject of our illustration (fig. 131), in the exhibit of the British Horological Institution in the Palace of Industry. The latter is used as the fundamental timekeeper of the 20 large electric clocks which serve the Palace of Industry, the Conference Hall, and adjacent buildings in that part of the Exhibition.

These clocks have been exhaustively tested at the Royal Observatory, Edinburgh, throughout the last two years by

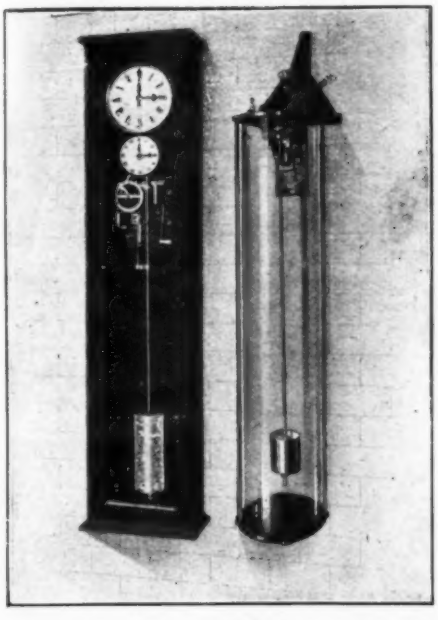

Fig. 131.—Synchronome Slave Clock and Free Pendulum.

means of special apparatus, including a kinematograph which takes cognisance of thousandths of a second. It is only by such means that any error has been discovered, and we are informed that the variations have never exceeded one-hundredth of a second in 24 hours.

### The D.P. Battery Co., Ltd.

(*Stand No.* 88, *Avenue* 13, *Bay* 5.)

Storage batteries of all kinds are exhibited by this company. A complete range of "D.P." stationary-type batteries ranging in size from 24-Ah to 12,000-Ah capacity is shown. Two complete batteries suitable for small installations are exhibited. In other instances two or three cells are exhibited in order to show the different types of connections. The cells are all mounted on similar type of stands to those supplied with the batteries. Special features are the substantial construction of the positive plates, not only for large central station batteries, but also for small private installations, and the specially-designed sections whereby the positive and negative groups, together with separators, are dispatched in one unit ready for fitting, thus saving labour in erection.

All the "D.P." batteries shown are of the "D.P." "Shortfirstcharge" type. The "Shortfirstcharge" system was first introduced by the company and enables batteries to be charged in about 15 hours instead of about 50 hours as hitherto.

Of special interest is a complete "Kathanode" battery, as exclusively used on the entire fleet of "Railodok" passenger cars touring in the Exhibition grounds. A section partly withdrawn from the container, also the various component parts of cells are shown, together with larger cells, as used on electric vehicles and locomotives.

Other types on view are submarine cells; train-lighting cells in glass and wood lead-lined boxes, also separate sections and component parts; motor-car starting and lighting batteries; and standard type radio batteries fitted with ebonite, wood, and "Kathanode" separation. A large number of "D.P." batteries are to be found in other parts of the Exhibition. There are 200 batteries on the "Railodok" passenger cars; others are in the power station and coal mine, on an electric truck and a large locomotive; and they are also in use with windmill plant and with country-house lighting sets. Another "D.P." battery, which is not on view, is working the models in "Canada."

### The Allen Hydrautomat.

(*Stand No.* 177, *Avenues* 1 *and* 2, *Bay* 10.)

So far the "Hydrautomat," or automatic water-raiser, has been regarded mainly as a rival or substitute for the older hydraulic ram, for lifting water for domestic use where a low fall and a small quantity are available, but to the electrical engineer the device may presently prove of far greater importance. The principle of working is well known, namely, the raising of a proportion of the available flow by means of combined vacuum and air-pressure created in an operating chamber at some point in a fall; it will suffice here to reproduce a photograph of the latest type of hydrautomat as exhibited at the British Empire Exhibition (fig. 132). The original apparatus was described in the ELECTRICAL REVIEW of June 16th, 1922.

Mr. J. W. Meares, M.Inst.C.E., late chief engineer of the Hydroelectric Survey of India, informs us that there is no theoretical reason why the principle should not equally be applied to the raising of really large quantities of water, such as are dealt with in hydro-electric practice. When that stage is reached, as it is soon likely to be, we shall have a valuable auxiliary, at least for small plants. In particular, the "Hydrautomat" will carry on with a load factor of 100 per cent. for an indefinite period, with no attendance and no working costs. The water lifted during the 24 hours can be utilised during the peak-load of an hour or two. In connection with tidal power it has seriously been proposed to utilise part of the power available at high and low tide for pumping up a reserve to a higher level, from which power can be obtained at slack water. It may be doubted whether

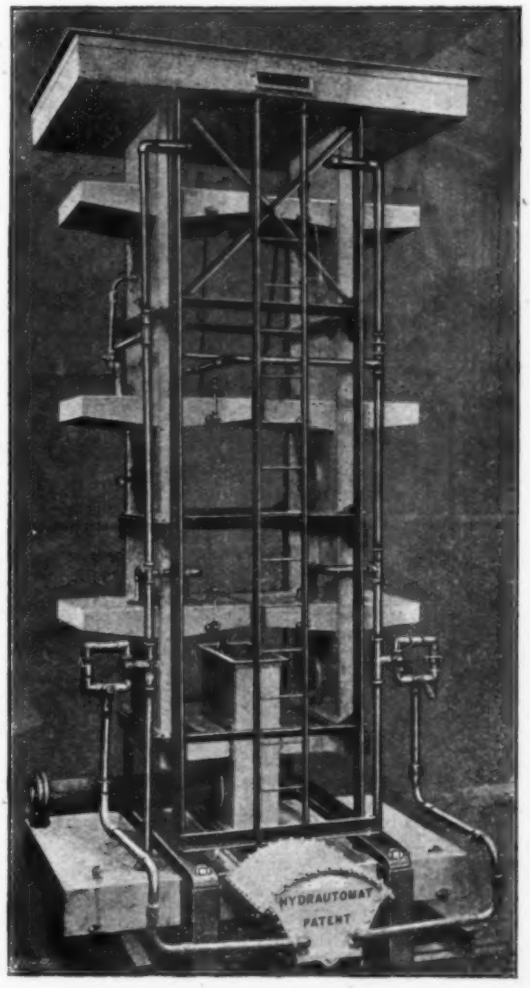


Fig. 132.—The Allen "Hydrautomat."

tidal power will ever be a commercial possibility in England, but at any rate the "Hydrautomat" brings it a step nearer. In the more ordinary case of a low-fall plant, there is generally water running to waste for the greater part of the day. If a reservoir site exists at some elevation above the head race, it will be practicable to utilise that higher head exclusively for generating purposes during the ordinary hours of demand, while keeping the reservoir filled by the constant operation of the "Hydrautomat." Furthermore, heads too low to operate a reaction wheel satisfactorily will still give an undiminished high efficiency with the water-lift, and thus create a head which can be so used.

# New Electrical Devices, Fittings, and Plant.

*Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.*

## The Rutter Pole.

MESSRS. GABRIEL, WADE & ENGLISH, LTD., of Hull, the well-known suppliers of teleghaph and telephone poles to the Post Office and others, who have carried out extensive tests on poles of various types from time to time, are now manufacturing under licence in this country a new type of pole for supporting overhead power lines and the like. As shown in fig. 1, the Rutter pole is formed of two ordinary creosoted poles,

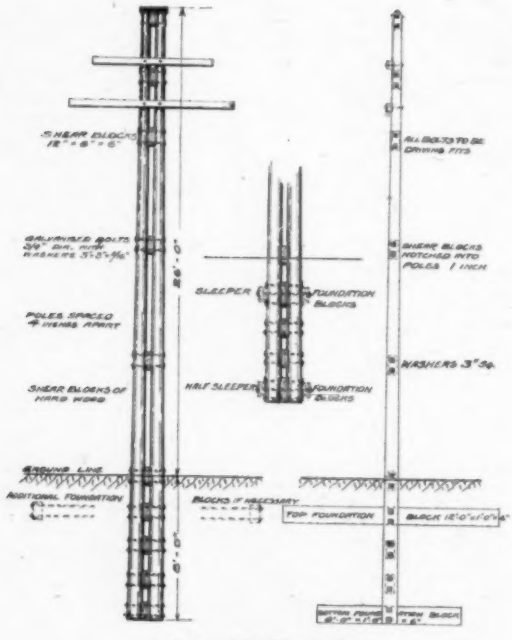


**Fig. 1.—The Rutter Pole.**

kept apart by a number of hardwood blocks, notched into them, through bolts being used as fastenings; the blocks not only keep the unit poles apart, but also resist the shear stress. The resistance to overturning is given by two long timber foundation blocks, placed between the two unit poles in the plane of the wires, and secured to the poles by bolts.

The Rutter pole is designed more or less as a girder. Picture the pole laid across two supports, one where the bottom

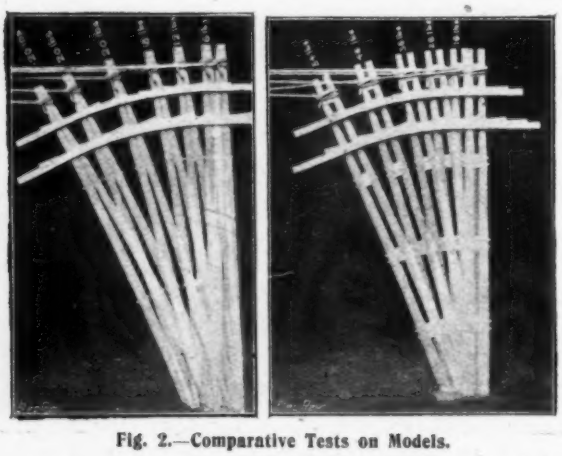

**Fig. 2.—Comparative Tests on Models.**

foundation is fixed, the other at the point of application of the resultant of the loads (say, 2 ft. from the top), and that a concentrated load is applied where the top foundation block is fixed. The shear blocks function as the web of a girder resisting the shear stress and, as the web of a girder similarly placed and loaded would be thicker between the load and the nearer support, so the shear blocks in the Rutter pole are placed closer together in the foundation portion because in that portion the shearing force is many times greater than in the part above ground depending on the relative distances. It is useless to place the shear blocks at equal distances along the pole, as the strength would only be that of two single poles, or little better. The poles would move one on the other, and the front leg, being under independent bending stress, would break first, followed immediately by the back one.

The resistance to overturning is very much greater than that of the "A" pole; the foundation blocks move in a horizontal direction—that is, parallel to the overturning forces, not in a vertical direction, as in the "A." If the ground is bad additional blocks can be fixed.

The railways have agreed to carry the poles assembled, *i.e.*, with the shear blocks and bolts in position, which obviates re-assembling on site.

Fig. 1 shows an alternative method of making the foundation portion, using ordinary sleepers, which will be cheaper.

The strength of a Rutter pole is calculated on the basis of a factor of safety of 5 on a modulus value of 7,800 lb., whereas the new regulations of the Electricity Commissioners only require 3.5, no modulus value being given. A test made at the works on a full-size pole developed a value of over 6,000 lb.

Fig. 2 shows the results of comparative tests on poles of model sizes, scale 1 in. to 1 ft., each illustration being a reproduction of a series of photographs on one negative. The pull applied to the pole is clearly marked; the illustration on the left is of the "A" pole, while that on the right is of the Rutter pole.

## An Automatic Switch-off Iron Stand.

A device for preventing the excessive heating of electric irons has been brought to our notice by the makers, THE BULLEN AUTOMATIC IRONSTAND ASSOCIATION, 4, Lonsdale Street, Carlisle. This is a stand containing a thermostatic device for cutting off the current to itself and, being in series with the iron, to the latter as well. A detailed view appears in fig. 3. In this A is a strip of expansion metal secured at one end and pressing against B, a pivoted lever. The movement of the latter is multiplied by another lever C, which has at its end a retaining catch for the main movement D. The last bears

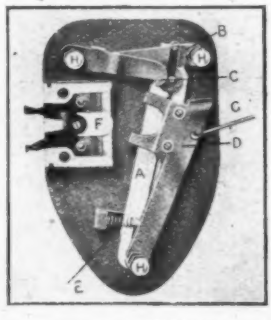


**Fig. 3.—An Automatic Switch-off Iron Stand.**

the connecting bridge of the switch F, and is retained by the catch on the lever C against the pressure of a spring E. When the temperature of an electric iron resting on the stand exceeds a pre-determined limit (about 180 deg. C) A expands, forcing levers B and C outwards until D is released and the current cut off. The switch can be reclosed by means of the push-rod G. The three footrests of the stand are marked H. The body of the stand is of hardened steel, and the switch parts are of phosphor-bronze, and rated at from 7 to 10 A. The insulation is porcelain and mica.

**Motor Car Engine-Starter Efficiency.**—Commenting on the performance of the 21 cars which took part in the recent six days' trials of small cars, organised by the Royal Automobile Club, the judges devote a special paragraph to the subject of electric engine starters. They state that with but four exceptions electric starters were fitted, and the fact that only two-fifths of a minute (in excess of the permitted half minute) were lost for starts after leaving the depot, and that no time in excess of the permitted two minutes was lost in the depôt, speaks well for the general excellence of this component. In only one case was the electric starter out of action at the end of the trials and this was alleged to be due to immersion of the accumulators at one of the water crossings included in the route traversed.

# Electrical Trade of Kenya and Uganda.

THE following table, based on the recently-issued official trade returns, shows the value of the imports of electrical and allied material into Kenya and the Uganda Protectorate during the past year. The figures for 1922 have been given for purposes of comparison and notes of any increases or decreases added.

| | 1922. £ | 1923. £ | Inc. or dec. £ |
|---|---|---|---|
| *Electric wire and cable, insulated.*— | | | |
| Total ... ... | 29,000 | 72,000 | + 43,000 |
| From United Kingdom ... | 27,000 | 71,500 | + 44,500 |
| „ Germany ... ... | — | 200 | + 200 |
| *Electric wire and cable, not insulated.*— | | | |
| From United Kingdom ... | — | 400 | + 400 |
| *Electrical goods and apparatus not elsewhere specified.*— | | | |
| Total ... ... | 6,000 | 6,000 | — |
| From United Kingdom ... | 5,000 | 4,000 | - 1,000 |
| „ Germany ... ... | 100 | 500 | + 400 |
| „ Sweden ... ... ... | — | 700 | + 700 |
| „ United States ... ... | 500 | 500 | — |
| *Telegraph and telephone instruments.*— | | | |
| From United Kingdom ... | 3,000 | 500 | - 2,500 |
| *Cranes, hoists and lifting machinery.*— | | | |
| Total (United Kingdom) ... | 5,000 | 400 | - 4,600 |
| *Electrical machinery and parts.*— | | | |
| Total ... ... | 2,700 | 2,200 | - 500 |
| From United Kingdom ... | 1,000 | 1,900 | + 900 |
| „ Sweden ... ... ... | 600 | — | - 600 |
| „ United States ... ... | — | 300 | + 300 |
| „ Belgium ... ... ... | 1,000 | — | - 1,000 |
| *Steam engines.*— | | | |
| From United Kingdom ... | 3,600 | 9,000 | + 5,400 |
| *Industrial machinery and parts.*— | | | |
| Total ... ... | 2,000 | 132,000 | +130,000 |
| From United Kingdom ... | 500 | 125,000 | +124,500 |
| „ India ... ... ... | — | 2,000 | + 2,000 |
| „ Germany ... ... | — | 2,500 | + 2,500 |
| „ United States ... ... | 1,500 | 1,700 | + 200 |
| *Pumps and pumping machinery.*— | | | |
| Total ... ... | 1,200 | 3,200 | + 2,000 |
| From United Kingdom ... | 800 | 2,800 | + 2,000 |
| „ United States ... ... | 400 | 400 | — |
| *Machinery, not specified, other than agricultural.*— | | | |
| Total ... ... | 78,000 | 7,000 | - 71,000 |
| From United Kingdom ... | 70,000 | 6,000 | - 64,000 |
| „ India ... ... ... | 1,000 | — | - 1,000 |
| „ South Africa ... ... | 1,500 | — | - 1,500 |
| „ Belgium ... ... ... | 1,600 | — | - 1,600 |
| „ Germany ... ... | 1,600 | 500 | - 1,100 |
| „ United States ... ... | 800 | 500 | - 300 |

# Parliamentary.

**[By Our Special Parliamentary Reporter.]**

**Electricity Undertakings.**—On June 23rd, Mr. ALEXANDER, Parliamentary Secretary to the Board of Trade, said that the number of authorised electricity undertakers, as stated in the third annual report of the Electricity Commissioners for the year ended March 31st, 1923, was 544.

**Site of "2 L.O."**—On June 24th, Mr. HARTSHORN, Postmaster-General, informed Mr. BAKER that the Broadcasting Board had reported that a transfer of the London Broadcasting Station was necessary and that, in its opinion, the suggested site was the only one at present available which, for technical reasons, would be suitable. It had recommended that the site be adopted for a minimum period of one year, subject to a condition—which the British Broadcasting Company had already imposed—that the presence of the station was not to be utilised as a medium for advertising, and a further condition that visitors were not to be admitted except for technical or official reasons. He had accepted the Board's advice and had informed the British Broadcasting Company accordingly.

**Inspection of Radio Sets.**—On June 24th, Mr. BAKER asked the Postmaster-General whether he had considered the desirability of instituting official tests on all broadcasting sets manufactured for sale to the public; and, if not, whether he would consult the Broadcasting Board with a view to instituting machinery for this purpose.

Mr. HARTSHORN said that he did not consider that the advantages of a system of inspection such as was suggested would justify the large expense involved, and he did not see his way to adopt the suggestion.

**Wireless to India.**—On June 24th, Mr. HANNON and Lt.-Col. HOWARD BURY asked the Postmaster-General whether he was aware that the British official wireless news that was distributed in India had ceased, and that in consequence of this the German and French radio stations had now a free field.

Mr. HARTSHORN said he understood that there was difficulty in receiving the British official wireless messages in India during the adverse atmospheric conditions which prevailed in that country at this time of the year. He was aware that the range of the German and French radio stations was greater than that of any existing British station, but this unsatisfactory state of affairs would be remedied when the new Government station being erected at Rugby was finished.

**London Telephone Service.**—On June 24th, Captain BRASS asked the Postmaster-General whether he was aware of the grave inconvenience caused to telephone subscribers in the London area by the abrupt cutting off of their conversations without warning; and, in view of this fact, whether he would give instructions for special observations to be kept on the Bank and Gerrard exchanges.

Mr. HARTSHORN said the service was under continuous observation and the records did not indicate that the number of premature disconnections was exceptional at the exchanges referred to. Interruptions of this kind were due not only to electrical faults and accidental disturbance of connections at the exchanges but also to indifferent operating at subscribers' private branch exchanges. If the hon. member would give him particulars of any installations on which disconnections had been unusually noticeable, he would have inquiry made with regard to them.

**Private Bills.**—On June 25th, the Lanarkshire Hydro-Electric Power Bill, the London Electricity Supply Bills (Nos. 1 and 2), the North Metropolitan Electric Power Supply Company Bill, the County of London Electric Supply Company Bill and the City of London (Various Powers) Bill were read the third time in the House of Lords and passed.

**Unemployed Mechanics.**—On June 25th, Mr. SHAW, Minister of Labour, informed Mr. LUMLEY that the number of men in Great Britain and in the North-Eastern Division respectively who were registered at Employment Exchanges on May 26th, 1924, as unemployed in the various branches of the engineering trades was as follows, the numbers for the North-Eastern Division being given in parentheses:—Engineering, engineers' iron and steel founding, 93,209 (21,084); electrical engineering, 2,482 (393); marine engineering and marine boiler making, 9,025 (5,755); constructional engineering, 2,801 (678); total, 107,517 (27,910). The figures included not only mechanics but all workpeople whose last employment was with firms engaged wholly or mainly in the trades mentioned.

**Local Authorities' Employés.** — On June 26th, Mr. WHEATLEY informed Sir W. ALLEN that in the following occupations the total number of persons employed by local authorities in England and Wales was as follows:—Tramways, 60,812; harbours, docks, &c., 42,444; electricity supply, 22,098; waterworks and hydraulic power, 15,933; and rolling stock manufacture, 2,783.

# Legal.

**Relay Automatic Telephone Co., Ltd., v. Electrical Contracts and Maintenance Co., Ltd.**

IN the Official Referee's Court on June 23rd, Sir Francis Newbolt, K.C., had before him an action brought by the Relay Automatic Telephone Co., Ltd., against the Electrical Contracts and Maintenance Co., Ltd., claiming a sum of £420, being the balance of an account for goods supplied and repairs executed. Defendants denied liability, contending that the plaintiffs had not allowed them a sufficient sum for work done at the London Hospital.

Sir Walter Schwabe, K.C., and Mr. Herbert D. Samuels appeared for plaintiffs, and Mr. R. P. Croome-Johnson for defendants.

Sir W. SCHWABE said that the claim to a large extent was admitted, but the defendants raised a bigger matter, as the claim which they had set up was that there was an arrangement under a written contract with the plaintiffs that defendants should be employed as agents for the installation of "Relay" automatic telephone systems upon the terms that they were to be allowed by the plaintiffs 10 per cent. on prices charged both for switchboards and instruments upon all orders which defendants obtained for them whether such orders were taken by the defendants or sent or given to the plaintiffs directly by a customer as a result of the defendants' introduction of the system. Defendants therefore counterclaimed for such commission or discount and for an account to be taken. Plaintiffs said that this was "all nonsense."

After hearing counsel on both sides, Sir FRANCIS NEWBOLT, giving judgment, said that although the agreement was in writing it was very difficult to understand and very badly

drafted. It was, however, clear that he must give judgment for the plaintiffs on their claim on the agreement taken altogether.

MR. CROOME-JOHNSON said that he was unable to proceed with the other parts of the case as his solicitor client had withdrawn from it, which placed him in a difficult position.

The Official Referee said he would enter judgment for the plaintiffs for the claim, and if an undertaking for further or better affidavits was carried out he would adjourn the case to that day fortnight.

### The British Insulated and Helsby Cables, Ltd., Pension Fund.

IN the King's Bench Division on June 24th, Mr. Justice Rowlatt commenced the hearing of an appeal by the Crown from a decision of the Commissioners for the Special Purposes of the Income Tax Acts. This exempted from income tax a contribution of £31,784 which the company had made from its profits to form the nucleus of a staff pension fund. The respondent company claimed that the payment of pensions to employés was an ordinary business expense and a continuous business demand, and the Commissioners concurred in this view. The Crown contended, however, that the sum was not money wholly and exclusively laid out for the purposes of trade.

The Attorney-General (Sir Patrick Hastings, K.C.) and Mr. R. P. Hills represented the Crown, and Messrs. A. M. Latter, K.C., and Hildesley appeared for the respondents.

His LORDSHIP gave judgment on June 25th, dismissing the appeal. He said that the respondent company, in order to attract and retain a good staff, deemed it wise to inaugurate a pension scheme. The scheme was that a fund should be created by contributions of 5 per cent. from the employés' salaries, and if the fund had been started with new and young employés, such sums would have been sufficient for the purpose. The company, however, had to provide for people who had been in its employment for some time, and funds were required immediately. A sum of £31,784 was therefore provided out of profits and deducted from these in assessing liability to income tax. If the company had started to pay the pensions year by year it would not be disputed that such payments were business expenses. The question was whether the lump sum, which had been paid to prevent these sums from having to be paid later, could be deducted. After comparing the instance with a case which had been cited by the Attorney-General, his Lordship said that he considered that there was no distinction of principle, and the appeal must therefore fail.

### Times Electrical Co., Ltd., v. Nelson.

IN the Mayor's and City of London Court on June 25th, before Mr. Registrar Dell, the plaintiffs claimed £4 16s. 6d., representing the balance of an account for goods supplied, from Mr. W. Nelson, electrician.

Mr. H. STROUTS, for the claimants, said that his clients had supplied a flasher and an "Astro" reflector to the defendant. Some months afterwards defendant returned the flasher with the contacts burned out, and it was repaired free of charge, and since then no further complaint had been received. The defendant said that he ordered a flasher for a 500-c.p. gasfilled lamp. When a lamp of this size was placed in the flasher it burned out in two months. He took the flasher back, and it was returned by the makers bearing a label stating that it was unsuitable for employment with a 500-c.p. lamp. The plaintiffs said that the order was for a 500-W flasher, but that was not what he wanted. The REGISTRAR said that if the flasher was not what defendant ordered, he should have returned it. A representative of the plaintiffs said that for a 500-W lamp a larger flasher should have been ordered on account of the larger consumption which persisted momentarily when the lamp was switched on.

The REGISTRAR said that the plaintiffs were entitled to the cost of the flasher, but the defendant could proceed against them for damages if he thought fit. Plaintiffs, however, might be prepared to make some allowance to prevent further action. He gave judgment for the plaintiffs for the amount claimed.

**Electrical Equipment for Colonial Motor Cars.**—An Empire Automobile Conference was held at the British Empire Exhibition last week, during which an interesting paper on "The Requirements of the Colonial Market" was read by Mr. F. A. Stepney Acres, M.I.A.E. Dealing with the electrical equipment of motor cars for the colonial market, the author pointed out that it was essential that it should be watertight; the magneto, dynamo, and engine starter must therefore be carried as high as possible on the engine and flange-fixed types used wherever possible. The dynamo should, if possible, be directly driven; but if belts were used they must be carefully shielded from both water and oil and must be readily replaceable and adjustable. Special care must also be taken with the wiring, while switches and switchboards must be so arranged and located that water could not possibly enter them. As to ignition, Mr. Acres stated that he would like to see the old duplex system of both magneto and coil and battery ignition fitted on colonial cars, but if only a single system was employed it must undoubtedly be of the high-pressure type.

## Published Specifications.

Compiled expressly for this journal by Patent Agents.

The name of the applicant's patent agent, if any, will be found on the printed specification.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

### 1923.

3,380. "Resonators for loud-speaking telephones." F. J. Empsom. February 5th, 1923. (216,912.)

3,456. "Permutation switches applicable for use on motor road vehicles." A. E. Willis and W. Turton. December 1st, 1923. (216,914.)

6,072. "Electric protective systems." Electrical Improvements, Ltd., and L. C. Grant. March 2nd, 1923. (216,924.)

6,171. "Method of connecting multiple headphones to wireless receiving sets." A. Allen (deceased). March 3rd, 1923. (216,926.)

6,264. "Anti-splash guards for tramcar wheels." J. E. Patterson and A. D. Scarlett. March 5th, 1923. (216,931.)

6,346. "Switchgear for use in high-tension transmission systems and the like." E. C. R. Marks (Delta-Star Electric Co.). March 5th, 1923. (216,935.)

6,350. "High-speed dynamo-electric machines for continuous current." M. Kostenko and N. Japolsky. March 5th, 1923. (216,936.)

6,453. "Combined electric motors and pumps." T. L. R. Cooper. March 6th, 1923. (216,939.)

6,475. "Apparatus for counting telephone calls." D. S. Ellis. March 7th, 1922. (194,701.)

6,501. "Mercury-vapour ejector or vacuum-producing apparatus." "Date" Laboratorium und Industrie-Bedarf Ges. March 6th, 1922. (194,324.)

6,593. "Variable electric resistances." Co-operative Cinematograph Co., Ltd., and H. Street. March 7th, 1923. (216,944.)

6,626. "Acoustic reproducing devices." Western Electric Co., Ltd. (Western Electric Co., Inc.). March 7th, 1923. (216,946.)

7,296. "Electric generators." Soc. Anon. "Electrolabor." March 13th, 1922. (194,732.)

7,621. "Overhead electric transmission lines." A. A. Bull and Callender's Cable and Construction Co., Ltd. March 16th, 1923. (216,965.)

8,225 "Electrical devices for the control of mechanical movements." English Electric Co., Ltd., and F. Morris. March 22nd, 1923. (Cognate application, 12,603/23.) (216,972.)

8,820. "Aerial for wireless reception." A. W. Vincent. March 28th, 1923. (216,981.)

9,502. "Loaded telephone and the like transmission systems." Western Electric Co., Ltd. (Western Electric Co., Inc.). April 6th, 1923. (216,992.)

9,974. "Wireless receiving apparatus." J. G. Lucas. April 12th, 1923. (216,996.)

10,000. "Electric current collecting brush devices." Metropolitan-Vickers Electrical Co., Ltd. April 13th, 1922. (196,290.)

10,324. "Telephone exchange systems." R. C. Arter. April 17th, 1922. (196,300.)

10,545. "Electric cables." F. J. Cooper and Callender's Cable and Construction Co., Ltd. April 18th, 1923. (217,000.)

10,724. "Multi-core electric cables." A. W. Williams. April 20th, 1923. (Cognate application, 20,711/23.) (217,002.)

11,093. "Electric batteries." D. Pepper. April 24th, 1923. (217,004.)

11,299. "Electric winches." W. H. Scott. April 26th, 1923. (217,007.)

12,160. "Electric fuse and like fittings." W. T. Henley's Telegraph Works Co., Ltd., and H. W. Breeze. May 5th, 1923. (217,010.)

12,290. "Thermo-electric generator." C. R. H. Bonn. May 8th, 1923. (217,013.)

12,368. "Electric switches." British Thomson-Houston Co., Ltd. (General Electric Co.). May 8th, 1923. (217,013.)

12,734. "Incandescent electric lamps and other similar apparatus." L. S. Vello. May 12th, 1922. (Patent of addition not granted.) (197,693.)

13,243. "Leading-in tubes for wireless aerials." R. W. Robins. May 17th, 1923. (217,022.)

13,383. "Vibratory diaphragms." Soc. Française Radio-Electrique. May 20th, 1922. (197,958.)

13,628. "Electrically-operated starting and stopping device for talking machines." C. Lott. August 7th, 1922. (198,360.)

14,878. "Interchangeable variable tuning and like devices for wireless apparatus." Sterling Telephone and Electric Co., Ltd., and W. M. Holbeach. June 6th, 1923. (217,042.)

15,257. "Inductance coils and method of manufacture of the same." J. D. Dunthorne and W. J. Rickets. June 12th, 1923. (217,045.)

16,173. "Sound-producing devices." W. J. Mellersh-Jackson (Submarine Signal Corporation). June 21st, 1923. (217,056.)

16,231. "Current-collecting brush devices." Metropolitan-Vickers Electrical Co., Ltd. July 5th, 1922. (200,499.)

16,403. "Electromagnetic wave signalling systems." E. Boselli. June 25th, 1923. (217,060.)

16,439. "Electric fuses and the like." F. H. Rogers (Schweitzer & Conrad). June 25th, 1923. (217,061.)

17,415. "Crystal detectors for wireless telegraphy and telephony receiving apparatus." H. H. Parkin, G. Parkin, W. Parkin, and F. Parkin. July 5th, 1923. (217,066.)

17,605. "Junctions between coil protective casings and electric cables." Felten & Guilleaume Carlswerk Akt. Ges. July 6th, 1922. (200,521.)

19,606. "Electrolytic recovery of zinc from zinc-bearing ores and metallurgical products. Electrolytic Zinc Co. of Australasia, Ltd. August 8th, 1922. (202,299.)

19,982. "Apparatus for electrically producing ozone." Ozon-Technik Akt. Ges. March 29th, 1923. (201,938.)

20,471. "Thermally-controlled electric switches." British Thomson-Houston Co., Ltd. August 11th, 1922. (202,321.)

21,075. "Ignition systems for explosion engines." A. Howard. August 20th, 1923. (217,096.)

22,913. "Separators for electric accumulators." H. J. Hampton. September 12th, 1923. (217,108.)

29,153. "Sound-reproducing apparatus." M. Weil. November 21st, 1922. (207,522.)

29,387. "Electric accumulators or secondary batteries." Chloride Electrical Storage Co., Ltd. (Electric Storage Battery Co.). November 21st, 1923. (217,131.)

30,923. "Connection for electric dry batteries." C. J. Werts. December 8th, 1923. (217,141.)

### 1924.

1,978. "Automatic centrifugal switches for electric lighting machinery." Frankonia Akt. Ges. Vorm A. Frank. January 29th, 1923. (210,441.)

2,464. "Electric control systems." Metropolitan-Vickers Electrical Co., Ltd. February 3rd, 1923. (210,780.)

**Whitworth Society.**—The summer meeting of the Society will be held on July 8th. A dinner will be held at the Holborn Restaurant at 6.30 for 7 p.m., morning dress. Dr. H. S. Hele-Shaw, F.R.S., the retiring President, will install the new president, Mr. R. B. Buckley, C.S.I. (the Senior Whitworth Scholar). Application for tickets should be made to the hon. secretary, c/o Institution of Mechanical Engineers, Storey's Gate, Westminster, S.W.1.